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Shaft-Rockhouse Practice in the Copper Country--I

By L. Hall Goodwin*

SYNOPSIS—The rockhouse is a coarse-crushing plant. Now usually combined with shafthouse and properly called shaft-rockhouse. Mining conditions govern shaft-rockhouse practice. Variety of work carried on in shaft-rockhouse. Steady improvements in design have produced modern structures, permanent, fireproof and convenient. Steel and concrete substituted for wood. Modern shaft-rockhouse consists of headframe and crushing structures over large steel bin, set at shaft collar. Blake crushers of improved design now used. Hand work reduced to minimum. A few structures over vertical shafts and a few detached rockhouses. Four structures of most advanced type just erected.

In the early days of copper mining in the Lake Superior copper country it became the practice to interpose between the mine headframe and the concentrating mill an intermediate building, known as a rockhouse, the function of which was to segregate the hoisted products and prepare them for the mill and the smelting plant respectively. Later this building was combined with the headframe to form one structure, the combination shaft-rockhouse, which is referred to promiscuously in the district as "shafthouse" or "rockhouse," although the latter is perhaps the more common designation. An intermediate step is exemplified by those headworks over some of the vertical shafts of the Tamarack, in which the two buildings are apparently made one, although they are in effect two separate structures on distinct foundations and separately framed and braced. Although in modern construction the two buildings are combined into one, the processes carried on in them are as distinctly separate as ever; and in this article I shall endeavor to be rather exact in nomenclature and refer all operations to the shafthouse, the rockhouse, or the shaft-rockhouse according as they properly belong to one of those buildings.

The modern shaft-rockhouse must handle a large tonnage of low-grade copper rock at a low unit cost, which necessitates the employment of every possible labor-saving device. Improvements in this line have been rapid, particularly during the last 10 years, and the operation of the modern shaft-rockhouse is highly efficient.

It is the purpose of this article briefly to review the shaft-rockhouse practice of the district as a whole. The aim will be to compare the operation of typical modern designs and to omit consideration of the older, the unusual and the inefficient methods. Here as in other places inefficient methods are in many cases still employed simply because the capital expenditures necessary for new and efficient equipment would not be amortized during the indicated probable life of the mine. The subject is broader than one might think, even with the elimination of much material; among over 75 operating shaft-rock-

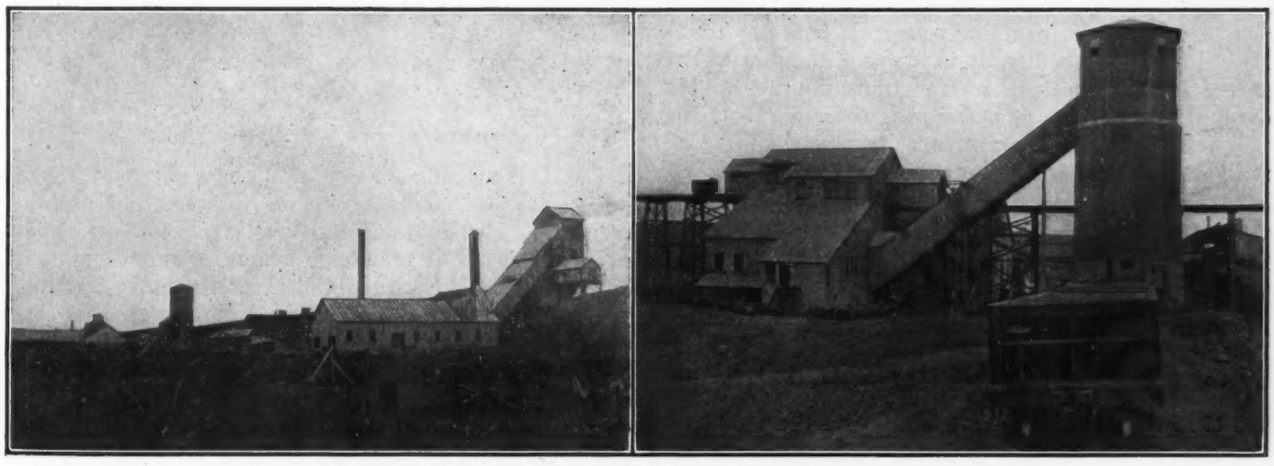

Fig. 1. Ahmeek Nos. 1 and 2; Shafthouses and Rockhouse Separate

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houses in the district there are hardly any two between which interesting and profitable comparisons might not be drawn.

Mining Conditions

The Lake Superior copper mines, without any exceptions which need be noted here, are located on inclined veins with roughly a north-south strike and a westerly dip. The lodes are comparatively narrow, the rock is of low grade, averaging only 19.53 lb.[1] per ton in 1912 for the seven mines which paid dividends in that year, and the shafts are deep. These conditions necessitate large outputs and high efficiency. The dip of the lodes at the surface varies at the different mines and in general increases as one passes southward from Calumet. Being 40° or less at the mines in and near Calumet, it increases to about 56° at the mines near Portage Lake and again increases to about 70° at the Copper Range Consolidated properties. Incline shafts are therefore the rule and vertical shafts exist only where the lode does not outcrop within the property limits.

Thus the typical Lake Superior rockhouse is set over an incline shaft, which has generally three compartments and in which two skips of from six to eight tons capacity hoist in balance. Exceptions to this rule are numerous, but are a small minority, and our attention will be largely confined to the type noted.

Uses of the Shaft-Rockhouse

The uses and requirements of a shaft-rockhouse are many and varied, as it must handle all men and materials entering or leaving the mine. Its principal function is to handle copper rock—to receive it, crush it to a size suitable to be fed to the mill stamps and to store it temporarily. Small tonnages of mass copper must be segregated from the copper rock and afterward prepared for smelting by being cleaned of adhering rock. Facilities must be provided for handling poor rock, either by tramming it over a trestle directly to the poor dump or by delivering it to main-line cars for transportation to the poor dump or by crushing and storing it for use about the mine or for selling. Storage capacity must be provided for the skips, man cars, and other conveyances and facilities furnished for easily and rapidly changing them on the hoisting rope.

Improvements in Design

The most important changes in design have been made possible by the substitution of steel and concrete for wood as materials of construction. In many cases this is extremely important from the standpoint of permanency alone. The fire risk, important in all mine headframes, has been eliminated by the erection of absolutely fireproof shaft-rockhouses. However, the most noteworthy progress has been made in the more effective arrangement of the various parts of the building, thus minimizing the amount of shoveling and of other hand labor.

In Fig. 2, *A*, *B* and *C* illustrate the development of shaft-rockhouse construction at the Quincy mine over a period of about 35 years and in a general way exemplify the progress of the district as a whole during that time. In *A* is shown the last shafthouse erected over No. 4 shaft, which was only recently torn down, although not used after 1908. This building was connected with the rockhouse, which in this case was 1100 ft. away, by a single-track trestle which entered through the small extension shown in the lower right-hand corner of the illustration.

The first shaft-rockhouse erected over No. 2 shaft is shown in *B*. I am told that this replaced a shafthouse exactly like that over No. 4 shaft. The present No. 2 shaft-rockhouse is shown in *C*, and this may be taken as typical in a general way of the uniform design to be discussed later. Thus the three pictures represent, in effect, three successive buildings erected over No. 2 shaft, the first a shafthouse, the other two shaft-rockhouses; they do not cover all of the headworks erected over that shaft, as there were at least one shafthouse and probably two houses of more primitive construction in the early days of the shaft.

The first shaft-rockhouse was built in 1894 and in 1906 was found to be unsafe because of decayed timbers, this rapid decay being caused by the updraft in No. 2 shaft. The former building offered no fire protection; the present one is as nearly fireproof as any building can be made. A better arrangement is evidenced by a comparison of the pictures and by the statement that the old building occupied 7400 sq.ft. of ground space, and had several large, widely separated, working spaces, whereas the present building occupies only 5100 sq.ft. and has, broadly speaking, only one working space, 44 ft. square, in which practically all of the rockhouse work is done. The different operations are carried on side by side and the labor required to deliver the different products from one process to another is reduced to a minimum. The tendency toward making the shafthouses permanent, fireproof and convenient is thus illustrated.

It will be understood that this comparison may be made without casting any reflection on the construction of the original shaft-rockhouse. That was a thoroughly modern building when erected and was a great improvement over earlier designs. The comparison serves to indicate what present managers may expect to have said of their present shaft-rockhouses 20 years from now.

Three Stages of Development

The shaft-rockhouse may be said to have passed through three successive stages as regards the materials of construction. The original ones were of course entirely of wood, and as late as 1895 large structures were being built of this material. Such buildings required heavy framing, for the vibration due to crushing, handling of mass copper, and especially to hoisting operations, was excessive, particularly since these operations are carried on at a considerable height from the ground. As has been noted in the case of Quincy No. 2 shaft-rockhouse, the draft from the upcasts soon plays havoc with the building, and this is also true of steel framed structures unless the exposed steel is repeatedly painted with a protective coating.

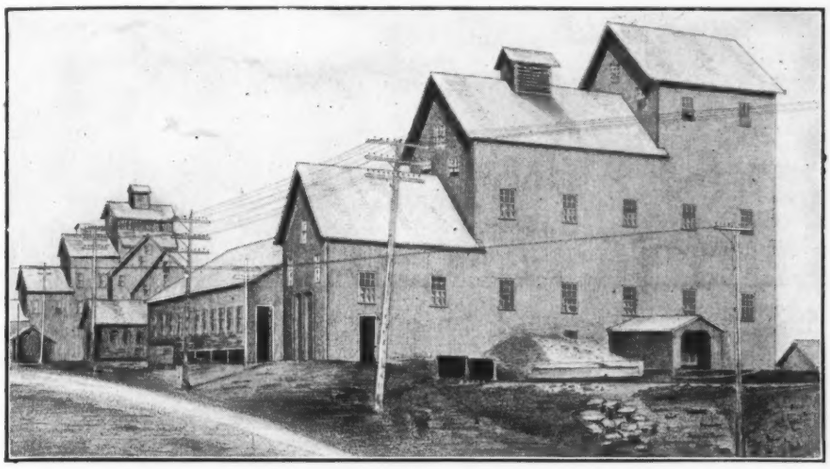
In the second stage a steel frame was used to support a wooden superstructure and floors. This has been common practice until recently. In the older buildings of this type the sidings were of boards and clapboards, but later galvanized iron attached either directly to the steel frame or over boards was always used.

In these first two stages the rock bins were of rectangular pattern, with sloping built-up bottoms, which were expensive to maintain. It is universally the custom at present to make the bottoms of all bins flat. The slop-

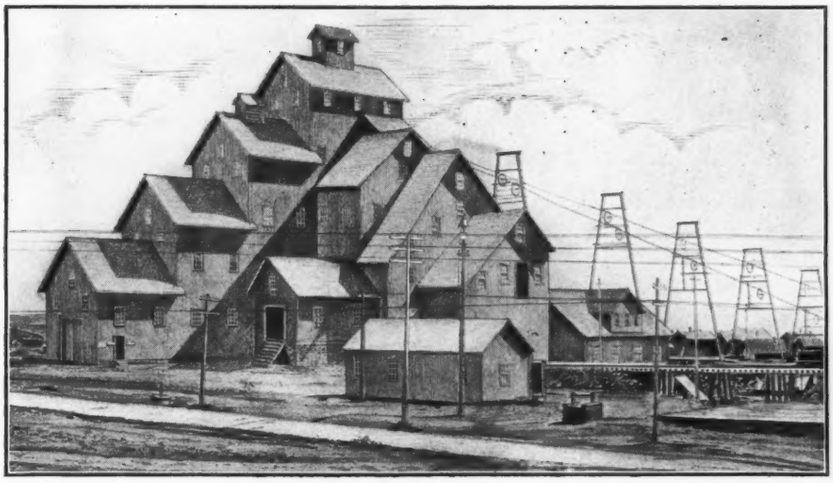
[1]Averaged arithmetically by mines, considering Copper Range Consolidated as one mine and Osceola Consolidated as one mine.

ing bottom is obtained by filling around the edges of the bin with large boulders of poor rock and then dumping in finer waste rock until it assumes its natural angle of repose with respect to the bin openings. This forms a resistant bottom which will absorb a great deal of shock without transmitting it to the walls of the bin proper. This illustrates a principle of broad application. For instance, the main storage bins in the Red Jacket shaft-rockhouse have steel I-beams running diagonally through them, which were protected when first installed by an inverted V-shaped sheet-iron guard. This protection was found to be insufficient and the scheme was finally hit upon of riveting a piece of sheet iron, about 3 ft. wide, along the top of the I-beams on which rock accumulated and formed a good protection.

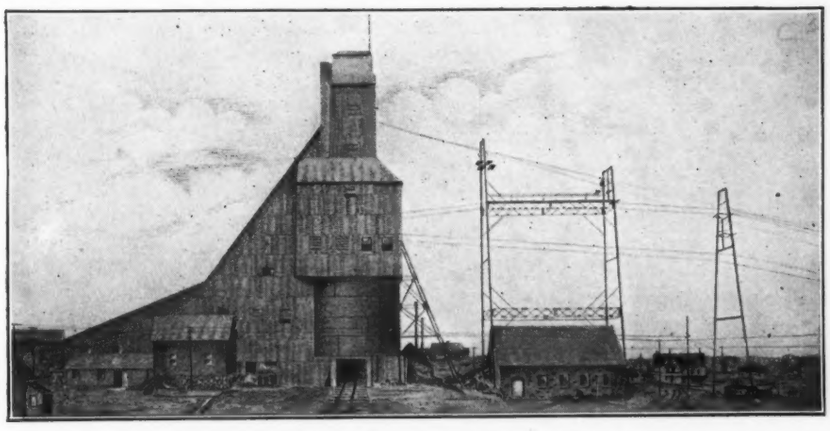
The third and latest stage in the evolution of construction methods uses a steel frame with reinforced-concrete construction throughout. Wood is used sparingly, if at all, and the fire risk is absent. Because of the heavy material handled in the building the reinforcing at many points must be exceedingly heavy, and in places this amounts to embedding heavy iron to form the exposed surfaces, especially corners. Skepticism was at first expressed as to the adaptability of reinforced concrete to this field, but results have shown it to be satisfactory where properly designed.



A—The Last Shafthouse Over No. 4 Quincy Shaft



B—The First Shaft-Rockhouse Over No. 2 Quincy Shaft



C—Modern Structure Over Quincy No. 2 Shaft

Fig. 2. Progression in Copper Country Shaft-Rockhouse Design

Uniformity in New Construction

Along with these improvements has come a tendency to standardize the building, that is, to adopt a uniform type of shaft-rockhouse throughout the district, so that practically all of the recently built examples are alike in the governing features of their design, although practice varies widely in the minor details of construction.

This design, numerous examples of which dot the Copper Country along more than 26 miles of the strike of the Keweenaw series, may be briefly described as follows: A cylindrical steel storage bin of large capacity rests on massive concrete foundations at a sufficient height above the ground to allow the passage of main-line railroad cars below it. This bin forms the foundation for a building housing the crushing floor, which is actually the rockhouse. The head sheaves are set over the crushing floor at the top of the building, and in the larger shaft-rockhouses these are in the neighborhood of 125 to 150 ft. vertically above the collar of the shaft; from this height towers, supporting idler pulleys for the skip ropes, drop off on the foot side of the shaft to the engine house, while on the hanging side the building tapers down over the incline tracks of the skip road.

The headframe proper consists of girders bearing the head sheaves and the braces supporting those girders, the girders being designed for the breaking strength of the hoisting rope. The main brace acts along the path of the resultant pull of the two parts of the hoisting rope—that is, it bisects the angle made by the rope from the

engine and that from the load; the back brace consists of the truss supporting the inclined skip tracks. The heavy machinery of the crushing floor is carried on I-beams supported partly by the walls of the storage bin, but mainly by columns extending through the bin to the concrete bin foundations. The roof and sides of the building are covered with galvanized corrugated steel, attached either directly to the purlins and girts or directly to the sheathing.

Mechanical Improvements

Although the improved design of the rockhouse has been an important factor in gaining efficiency, it has been of relatively small moment when compared with the introduction of labor-saving mechanical improvements. The installation of larger crushing units has been perhaps the greatest single advance. As an example, there may be noted a rockhouse built in 1892, which at that time required the services of 12 men per shift and is now operated at much greater capacity by only three men per shift. If I were able to present exact figures as to the tonnages handled in this case, the comparison would be still more striking. This enormous increase in efficiency was largely made possible by the substitution, in two successive steps, of two 24x36-in. crushers for five crushers of smaller sizes.

All of the rockhouse crushers are of the jaw type, and all have the maximum movement of the jaw acting on the smaller sizes of the rock, which, of course, means a large crushing capacity and an irregular size of product: by them the rock is reduced to about 4-in. size, but uniformity in this regard is not important or desirable, as the purpose of the preliminary crushing is simply to reduce the rock pieces to a size which may be readily fed to the steam stamps at the mill, and in that feed a few pieces ranging up to say 4x6 in. in cross-section and 12 in. long will do no particular harm. In stating the size of crushers hereafter, the smaller dimension of the maximum jaw opening—that is, the distance between the jaws at their top—will be given first and then the larger dimension, the distance between the cheek plates. Thus the ordinary breaker of the Farrell make will be specified as 24x36 in., although the Farrell people reverse the figures and call it 36x24 in.

The original designs of the Blake crusher were not strong enough to handle a rapid feed of large sizes and reduce it to the required 4-in. size in one operation, or at least they would not stand up under this treatment. It was then necessary to crush the largest sizes of rock under the drop hammer and crush the remaining rock in two or three stages. In the rockhouse noted above as built in 1892 the five crushers used were of the following sizes: One 18x24 in., two 13x20 in., and two 9x12 in. The type of Blake crusher introduced by the Farrell Foundry & Machine Co. permitted feeding coarse sizes rapidly and running the crusher at much higher speed. This was accomplished by using a solid, one-piece cast-iron frame and by replacing cast iron at strategic points, such as the pitman, toggles, etc., by the toughest openhearth cast steel; by paying further attention to such points the duty and the life of the crusher were enormously increased. The usual type of crusher used throughout the district is, therefore, this Farrell machine of the Blake type, 24x36 in. in size. The Calumet & Hecla, however, has perfected another design, which it makes in its own shops. This is 24x48 in. and is used exclusively in its new installations.

The use of air lifts and overhead trolleys, of drop and steam hammers, has had an even more marked effect on the methods of handling mass copper. It was only a few years ago that mass was handled entirely by strong-arm methods, aided only by bars, wedges, etc. It was subsequently cleaned by the fire method—that is, by building a fire under a huge pile of the mass and thus rendering the adhering rock friable.

Shaft-Rockhouses Over Vertical Shafts

It has already been stated that the incline shaft is the more common. The famous Red Jacket vertical shaft of the Calumet & Hecla was originally planned to serve a distinct mine not connected with any other workings, so that in case of a fire in any of the incline shafts the company would have large reserves, served by the Red Jacket, from which it could keep up production; with this exception, vertical shafts are used only at the Tamarack, the Tamarack Junior, and the Hancock Consolidated, where the valuable lode underlies the property at great depth. There is another type of shaft, however, which merits attention. Profiting by the experience of the Tamarack, which in this as well as other departments bears witness to the statement "the only thing that mining at the Tamarack has shown is how not to mine at great depths," the Allouez and Ahmeek mines, which were confronted with a similar problem, reached the lode by sinking steeply incline shafts, the inclination of which changes to correspond to that of the lode when the proper depth is reached. The shafts leave the surface at an angle of about 80°, which is changed to that of the lode by simple or compound arcs of circles. By means of guides in the steep part of the shaft, the usual form of self-dumping skip is used, and the design and operation of the shaft-rockhouses do not differ essentially from those over incline shafts.

The Tamarack headworks, being of older design and serving a decadent mine, are not operated in an uptodate manner; rock is still hoisted in the tram cars on cages, and rockhouse methods are correspondingly inefficient. The Red Jacket rockhouse, while not of the most modern design, is operated in a thoroughly efficient manner, and because of the large tonnage handled it shows a low cost per ton. There are no special points in regard to it, however, which need elaboration, as its methods will be covered later in the consideration of those of the Calumet & Hecla.

The Hancock vertical shaft-rockhouse is in a different position, as it is one of the most modern in use. Its design and methods will be taken up later.

Detached Rockhouses

At the Ahmeek mine there is found a reversion to the old practice of having the shafthouse and the rockhouse in two distinct and separate buildings. The rockhouse served by its Nos. 1 and 2 shafthouses, Fig. 1, is, it is believed, the only example in the district of what used to be universal practice. In this case the arrangement was adopted in accordance with a plan of concentrating all of the mechanical equipment for these two shafts, which are 1445 ft. apart, at a point midway between them. Thus the hoists, rockhouse, boilers, and shops are centrally located. Its only advantage, aside from the concentration of mechanical equipment, is the saving in construction expenditures; the central rockhouse, being built just above the ground, is comparatively inexpensive and the two shaft-

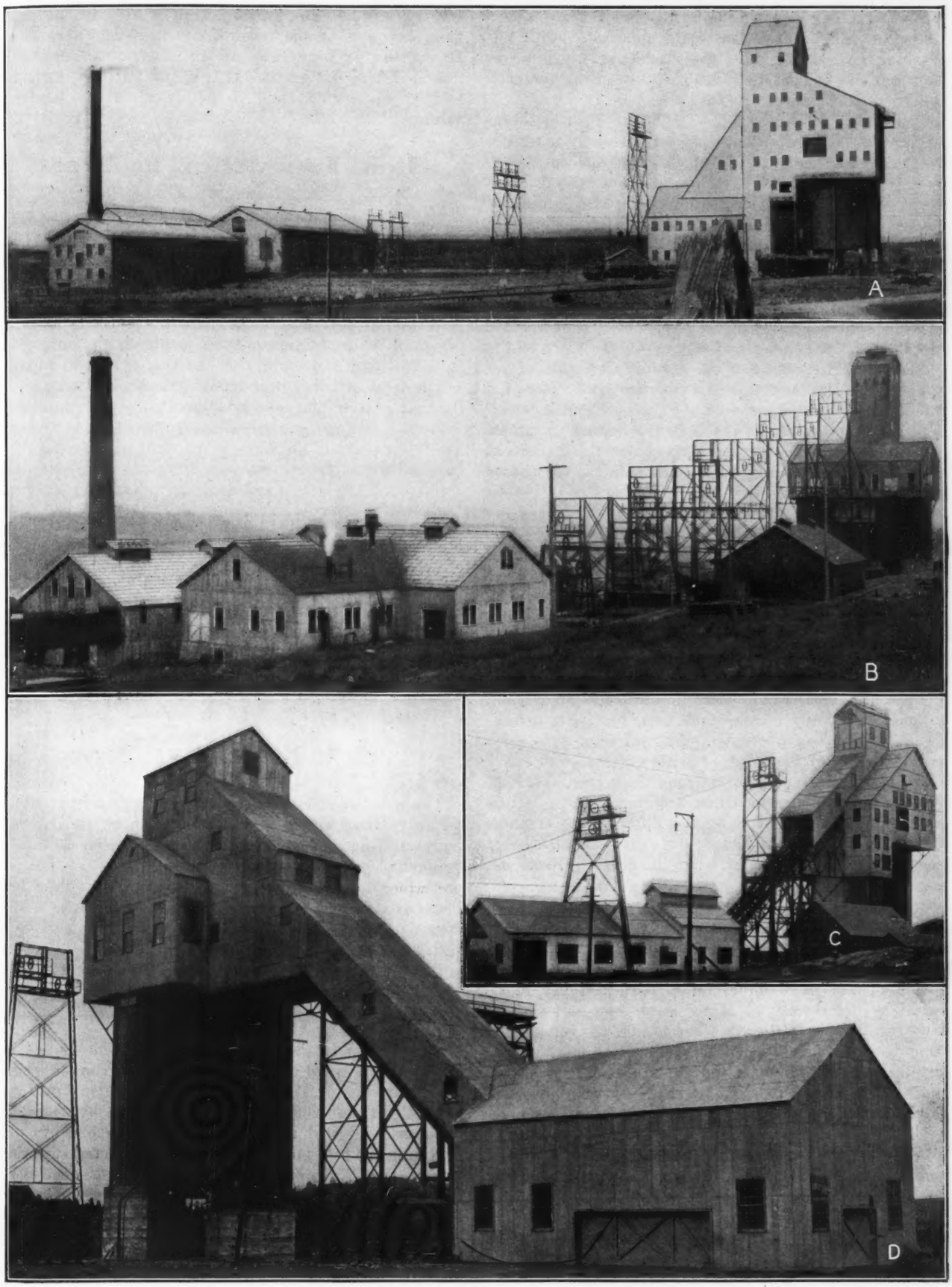


FIG. 3. RECENT EXAMPLES OF ADVANCED PRACTICE IN SHAFT-ROCKHOUSE CONSTRUCTION
A—Ahmeek Nos. 3 and 4. B—Hancock No. 2. C—North Kearsarge No. 1. D—Mohawk No. 6

houses are correspondingly so; the construction and maintenance of a long high trestle partly offset this advantage. The principal disadvantage would appear to be that if anything goes wrong with the machinery which serves both crushers two shafts rather than one are temporarily obliged to stop hoisting rock.

The system works as follows: The rockhouse is connected with either shafthouse by two double-track trestles 37 ft. high, upon either of which two 7-ton cars, each serving its respective skip, reciprocate on a tailrope haulage system between the skip dump in the shafthouse and the hopper bin in the rockhouse. From the hopper bin the rock passes to a traveling link-belt conveyor which feeds two 24x36-in. crushers. Under the crushers a hopper delivers to a shaker operated by a 7½-hp. motor, which automatically feeds the crushed rock to a link-belt bucket elevator operated by a 35-hp. motor, elevating the rock 48 ft. to the stamp rock-bin.

The South Kearsarge of the Osceola Consolidated accomplishes a similar result in a different way. Here the two shafts, 1100 ft. apart, feed one shaft-rockhouse, which is placed over one of the shafts in the normal way. All mechanical equipment is concentrated near the shaft-rockhouse, and this building is connected with the shafthouse by a double-track trestle.

Recent Construction

At the present time four shaft-rockhouses of the most approved designs are just entering upon their working careers. They are serving the following shafts: No. 6 of the Mohawk, No. 2 of Hancock Consolidated, Nos. 3 and 4 of the Ahmeek (one shaft-rockhouse over two shafts) and No. 1 of the North Kearsarge mine of the Osceola Consolidated. That practice varies widely in the design of these buildings is due partly to differences of opinion, but more especially because each mine has its own individual problems of operation. Natural conditions, such as varying dip of the veins, presence or absence of heavy mass copper, etc., and external conditions, such as size of output and shipping facilities, are among those factors which impose different designs. Photographs of these buildings are shown in Fig. 3; but further discussion of them will be left until later, when the different rockhouse methods will be discussed.

(To be continued)

U. S. Mining Statutes Annotated

One of the most important publications yet to be issued by the Bureau of Mines is to come out shortly, says the *Mining Congress Journal*. Two volumes of 1000 pages each will be devoted to a compilation embracing every statute or act ever passed by Congress having to do with metal, iron, gas or coal. It will be known as "United States Mining Statutes Annotated."

The annotations consist of abstracts of decisions of all courts of the United States, Federal and state, as well as decisions of the Land Office and of the Attorney General.

These volumes are the result of long and painstaking work on the part of Judge J. W. Thompson, chief of the legal section of the Bureau of Mines. In the opinion of competent authorities, this work will be worth many thousands of dollars annually to owners and operators of mines.

The last of the proof has been corrected on each of the volumes and the finished work is expected to come from the press of the Government Printing Office soon. Owing to the heavy cost of printing, this work will not be distributed gratis. It is a sale publication, to be sold at cost, which will be $1 or $1.50 for the two volumes.

Steel Production in Great Britain in 1914

The British Iron Trade Association reports the total production of steel in Great Britain in the year 1914 at 7,835,113 long tons. This is 171,237 tons more than in 1913, and is the largest make of steel ever reported. The war has stimulated rather than checked production. The increase last year was in the face of a smaller make of pig iron, the proportion of steel to pig having increased from 73.1% in 1913 to 87.0% last year.

The total production of ingots and direct castings for the year was, in long tons, as follows:

	Acid		Basic		Total
	Tons	%	Tons	%	Tons
Bessemer	797,072	10.2	482,444	6.1	1,279,516
Openhearth	3,680,848	47.0	2,874,749	36.7	6,555,597
Total	4,477,920	57.2	3,357,193	42.8	7,835,113
Total, 1913	4,860,154	63.4	2,803,722	36.6	7,663,876

The increase over 1913 was 171,237 tons, or 2.2%, being wholly in basic steel. In 1913 the total production of openhearth steel was 6,063,175 tons, or 79.1% of the total; of bessemer or converter steel 1,600,701 tons, or 20.9%. The proportions in 1914, as shown above, were 83.7% openhearth and 16.3% converter steel. There was a loss in converter of 321,185 tons, but a gain in openhearth of 492,422 tons.

The production of steel in Great Britain for 10 years past has been, in long tons, as follows:

1905	5,889,460	1910	6,374,481
1906	6,462,274	1911	6,461,612
1907	6,522,748	1912	6,795,144
1908	5,295,642	1913	7,663,876
1909	5,881,628	1914	7,835,113

The make of steel in 1914 was the largest reported in the 10 years. The gain does not so much indicate an increase in finished products as a gradual decrease in the production of wrought, or puddled, iron. In the 10 years the proportion of openhearth steel to the total has increased from 65.9% to 83.7%; while there was a decrease from 34.1% to 16.3% in the proportion of converter steel.

Map of Bering River Coal Field, Alaska

A new map of the Bering River coal field in Alaska has just been issued by the U. S. Geological Survey which is in some features a departure from previous publications. This map shows the areas underlain by the various grades of coal and the formations underlying and overlying the coal measures, and gives also structure sections. The results of the proximate or exact analyses of coal from different parts of the field are printed on the face of the map. All this information is given on a base map which shows the topography of the coal field and of adjacent areas. A small insert map indicates the geographic position of the coal field in Alaska.

The new publication can be purchased from the Director of the U. S. Geological Survey for 15 cents.

Prospecting for Minerals in Ontario

By J. A. Macdonald*

SYNOPSIS—The Ontario law governing prospecting is so worded as to be difficult for the uninitiated to understand, so an explanation is herewith given. Permits are necessary for all prospectors, and certain regulations are prescribed. Working permits may be obtained when sufficient value for claim staking is not immediately available.

There are a number of important legal requirements to be complied with by the prospector or mine owner in the Province of Ontario, which are difficult for some to understand through reading the Ontario Mining Act. It certainly takes a lawyer or a mining expert to interpret this correctly, and the average prospector has considerable difficulty in knowing what to do, though the sections of the act may be before him.

Particulars as to what lands are open can be obtained at the office of the recorder, where maps are kept showing the claims taken up and the lands still open, at the following places: Haileybury, Elk Lake, Matheson, Porcupine, Gowganda, Sudbury. Claims in unsurveyed territory must be as nearly as possible squares of 40 acres with boundaries running north and south and east and west. No more than three claims can be staked out or recorded in the name of any one person or licensee in the same mining division during a single license year. The boundaries of all claims must extend vertically on all sides. Each claim includes all minerals contained within it.

In case valuable mineral is not at once discovered, provision is made for obtaining what are called "working permits." When a prospector finds a vein or indications of mineral which is not good enough to stake, but which he desires to investigate, he may protect himself by erecting "prospecting pickets."

Until a discovery post is planted, or erected, all licensees have equal rights upon lands open to prospecting, except where a licensee has found what he believes to be a vein or deposit of mineral, or an indication of such. In this event he may erect at not more than 150 ft. apart two pickets at least 4 ft. high, to be known as prospecting pickets, marking each with the letters "P. P." and his name and license number. He may then dig a trench 6 in. deep and extending at least 6 ft. from each picket along the line running toward the other picket, as in Fig. 2. When this is impracticable, he may erect a monument of earth or rock, not less than 2 ft. wide at the base and at least 2 ft. high, likewise extending 6 ft. from each picket toward the other picket. He may also blaze the standing trees, if any, along the line between the pickets (Fig. 1). Thereafter, so long as he is diligently and continuously prospecting or following up indications on the block of land extending for 25 ft. on each side of a straight line between the pickets, he is entitled to the exclusive right to prospect and to make a discovery thereon.

There is nothing, however, to prevent any licensee from prospecting anywhere outside the limits of such block of land, and the first licensee to discover valuable mineral in place and stake out a mining claim thereon is entitled to the claim, the rights of the picketing licensee ceasing thereby. A licensee, moreover, cannot have more than one block of land "picketed" at one time; if he has more than one, all his picketings are voided.

Staking Promptly After Discovery

After a discovery of valuable mineral in place, the proprietor (licensee), if he desire to stake out a claim, must erect his "discovery post" and as quickly as possible proceed to complete the staking out of the claim, and if he be in fact the first licensee to make a discovery of valuable mineral in place and plant a discovery post thereon, no other licensee shall be entitled to encroach on or interfere with the property while he is so completing the staking out. If, however, he be tardy in his operations and fail to complete the staking out "with diligence and speed," he shall be liable to loss of his rights in case another licensee make a similar discovery upon the property and complete the staking out before him.

A licensee who has staked a mining claim, or upon whose behalf a mining claim has been staked out, must within 15 days furnish to the recorder an outline sketch or plan (Fig. 3) of the claim, showing the discovery post and corner posts and their distances from each other in feet, together with an application (Form 4) setting forth the name of the licensee by whom the valuable mineral was discovered and of the licensee on whose behalf (if working for a syndicate, company, etc., the application is made. He must also give the letters and numbers of licenses; the name, if any, of the claim, and its locality, etc.; the length of the outlines; the situation of the discovery post as indicated by the distance and direction from No. 1 post; the day and hour when the discovery

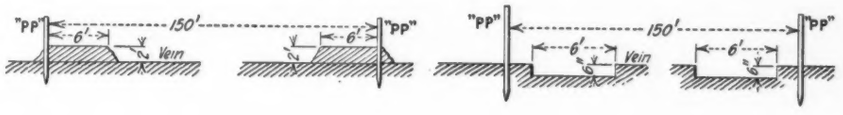


Fig. 1. Prospecting Pickets with Mounds

Fig. 2. Prospecting Pickets with Trenches

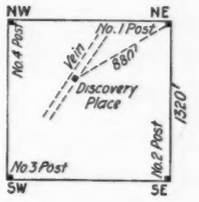


Fig. 3. Distance and Corner Posts

Fig. 4. Part Plan of Working Permit

*Ottawa, Canada.

of valuable mineral in place was made; the time the claim was staked out, and the date of the application. The prescribed fee for registering is $10.

A licensee who is the first discoverer of valuable mineral at a point not less than five miles from a known mine, vein, lode or deposit of the same kind of mineral, and who has staked a mining claim thereon, as in Fig. 3, accompanied by an affidavit, shall be entitled, on Crown Lands, to a patent without payment of a fixed price.

The applicant for a "free grant" must state in the affidavit accompanying the sketch and plan, Fig. 3, "that on.....day of....., 191.., at the hour of..... o'clock.....m., I discovered valuable mineral, etc., on the mining claim described and shown in sketch and plan hereunto attached," etc.

The following form must be used for recording a mining claim:

THE MINING ACT OF ONTARIO

Form 4. Department of Lands, Forests and Mines. Application to Record the Staking Out of a Mining Claim.

To the Mining Recorder of ..... Mining Division:

Application is hereby made under the provisions of The Mining Act of Ontario to record the staking out of a mining claim containing ..... acres or thereabouts, composed of the area shown on the sketch or plan hereto attached and more particularly described as follows:

The lengths of the outlines of the claim are .....

The name of the claim is .....

The discovery post is situate ..... feet from No. 1 post.

The discovery of valuable mineral in place, upon which this claim is based, was made on the ..... day of ....., 191.., at ..... o'clock ...m., by ....., holder of miner's license No. .....

The claim was staked out and the lines cut and blazed thereon on the ..... day of ....., 191...

The claim was staked out and is to be recorded in the name of ....., who resides at ....., whose post office address is ..... and who is holder of miner's license No. ....., dated the ..... day of ....., 191.., issued by the Mining Recorder of ..... Mining Division.

Dated at....., this ..... day of ....., 191...

Name of applicant, License number.

Note.—If the applicant is not a resident of Ontario the name, residence and post office address of some person resident in Ontario, upon whom service may be made, must be given as follows:

Service may be made upon ....., who resides at ....., in Ontario, and whose post office address is .....

WORKING PERMITS

A licensee may obtain a working permit, which gives him, for the purpose of prospecting for minerals, the exclusive possession of an area of land open to prospecting and staking out, such area being of the form and acreage prescribed for a mining claim. This is provided for as follows:

1. Stake out the corners and mark the boundaries of such area and place numbers and particulars upon the posts in the same manner as is provided for regular mining claims, omitting only what is provided in respect to the discovery post. (The words "working permit applied for" must be written or placed on No. 1 post, and each post must be notched with three rings of notches not less than ¼ in. deep and not less than 2 in. apart, beginning about 2 in. from the top, as indicated in Fig. 1.)

2. Supply to the recorder within 15 days after the staking out an application in duplicate indicating as definitely as possible the location of the area by reference to some ascertained boundary or locality, together with an affidavit giving the name of the licensee and other information considered necessary by the recorder to enable him to lay down the area on his office map.

3. Procure from the recorder a certificate of the application and securely affix the said certificate to post No. 1 within three days after the granting of the certificate.

4. Pay and secure to the owner of the surface rights, in the case of lands the surface rights of which have been heretofore granted, sold, leased or located, compensation for the injury or damage arising from the prospecting of such lands.

Upon compliance with these requirements and the payment of the prescribed fee, the applicant may, after 60 days from the staking out of the area, procure from the recorder a working permit which will be good for a period of six months from the date of its issue. A licensee is entitled to hold as many as three working permits in any one mining division. Until a working permit has been granted and a notice thereof (in legal form) has been affixed to No. 1 post, the area included in the application is subject to prospecting and staking out as a mining claim by any licensed prospector, but thereafter, during the continuance of the working permit or the renewal thereof, the holder shall have the exclusive right to prospect and stake out on this area.

If the holder of a working permit makes a discovery of valuable mineral in place upon the area of land included therein, he may stake out and record a mining claim there, and the necessary variations may be made in the application for the recording of the claim and in the affidavit to be filed.

The holder of a working permit must, within two weeks after its granting, start work on the claim, searching for minerals by sinking shafts or pits, digging trenches, making crosscuts, boring by diamond or other drills, or by other operations, to the extent of five days of eight hours in each week, provided such work may be accomplished in a lesser period than six months. No work, however, is required to be done between Nov. 16 and Apr. 15.

A working permit may be transferred, and the transfer must be duly recorded. The recorder can also grant to the holder of a working permit who has complied with the requirements one renewal for another six months.

Production of Sulphuric Acid in 1914

The production of sulphuric acid in the United States in 1914, according to preliminary figures reported to the U. S. Geological Survey, was equivalent to 3,762,417 short tons of 50° acid, valued at $24,163,331; this is exclusive of 21,993 tons of fuming acid, valued at $316,596, but includes the "byproduct acid" made by zinc and copper

PRODUCTION OF SULPHURIC ACID IN THE UNITED STATES IN 1914

Grade	Tons (2000 Lb.)	Value per Ton
50° Baumé	1,628,402	$5.96
60° Baumé	551,955	6.12
66° Baumé	916,192	11.47
Other grades	65,890	13.39
Total	3,162,439	$7.74
Total reduced to 50° Baumé acid*	3,762,417	$6.42

*Exclusive of 21,993 short tons of fuming acid valued at $316,596.

PRODUCTION OF SULPHURIC ACID BY COPPER AND ZINC SMELTERS
(Reduced to 60° Baumé acid)

	1913		1914	
Source	Tons (2000 Lb.)	Value per Ton	Tons (2000 Lb.)	Value per Ton
Copper smelters	336,019	$6.56	348,727	$6.35
Zinc smelters	296,218	7.23	411,911	7.22
Total	632,237	$6.87	760,638	$6.82
Total acid reduced to 50° Baumé	790,296	.....	950,798	.....

smelters. This byproduct acid was equivalent to 950,798 tons of 50° acid valued at $5,190,293; nearly three-fifths of the byproduct acid is credited to the zinc smelting works.

Montana Workmen's Compensation Law

SPECIAL CORRESPONDENCE

The new Montana workmen's compensation law is now in effect. Acceptance of its provisions is optional, and unless employers and employees both elect to accept its various provisions, the old law will apply. The law applies to all "hazardous employment," and about the only employments that are not included in the provisions are farm and other laborers engaged in agricultural and stock-raising pursuits, also household and domestic servants, and possibly clerks, bookkeepers and employees in stores, business houses and mercantile establishments, and practically all occupations where no power machinery of any kind is used. Interstate railroads do not come under the provisions of the act.

Both employer and employee, except as to public corporations, can exercise their pleasure as to which of three plans of compensation they wish to be bound by, or none, if they so desire. When the employer elects not to come under any of the plans, but to stay out, his affirmative defenses in an action for damages, consisting of negligence of the employee, unless willful, negligence of a fellow-employee and assumed risk, are excluded or denied him. When the employer elects to come in and the employee elects to stay out, the present law governs. When both elect to come in, the provisions of the act are exclusive. The employee is bound by the plan selected by the employer, unless he elects to stay out altogether.

It is the intention of the act that any employer engaged in hazardous occupations, before being bound by any of the compensation plans, elects to be so bound thereby and that the employee shall be presumed to have elected to be subject to and bound by the provisions of the particular plan which may have been adopted by his employer, unless the employee shall affirmatively elect not to be bound by the act. Neither can come in without the consent and coöperation of the other. The compensation for permanent disability is 50 per cent. of the employee's wages at the time of the accident, not exceeding $10 per week for a period of 400 weeks, and then $5 per week; for temporary total disability, 50 per cent. for a period of 300 weeks, not exceeding $10 per week; partial disability, half the difference between the wages received at the time of the injury and the wages he can afterward earn, not exceeding, however, the difference between such wages and the maximum amount allowed for total disability. The law is of especial interest to the mining companies, and it is generally understood that it was drawn to meet their objections and wishes. The advantage of the act to both employer and employee is generally conceded.

Plan No. 1 under the compensation law provides that any employer who can furnish satisfactory proof of ability to pay any and all of the benefits authorized by the act and also to discharge all liabilities likely to be incurred during the fiscal year may pay the compensation direct to the employees. Under plan No. 2 any employer may purchase an insurance policy, in any amount named by the board, or a larger amount if desired, in any insurance company licensed to transact business of this kind in Montana, but the insurance company is required to make deposits with the compensation board for protection of any payments of compensation the board may require. Plan No. 3 provides that any employer may come into a state insurance fund, which is divided into classes and employers are segregated under classifications, each class being assessed to pay whatever losses occur in the class, which makes these employers virtually a mutual insurance company with assessments at a point where the class is self-sustaining. The assessments which can be levied are not limited. If an employer defaults on any assessment levied he may be sued in the name of the state.

It is believed that the new act will forever settle the controversy over the question of workmen's compensation in the state of Montana and remove one of the harassing subjects of agitation against the mining companies.

Drilling Campaign of the Consolidated Coppermines Co.

Few people have appreciated the increase in the assets of the Consolidated Coppermines Co. at Kimberly, Nev., resulting from the drilling campaign inaugurated by the new management late in 1913. Summarized, the reserves reported to the officers of the company by Manager E. F. Gray are as follows:

	Tons	% Cu
Developed by churn drilling—sulphides ...	14,954,368	1.129
Developed by churn drilling—carbonates ..	998,529	1.720
Developed by underground work—sulphides	1,000,000	1.670
Total developed	16,952,897	1.19
Partly developed—sulphides.....	8,448,412	1.006
Total developed and partly developed ore*..	25,401,309	1.131

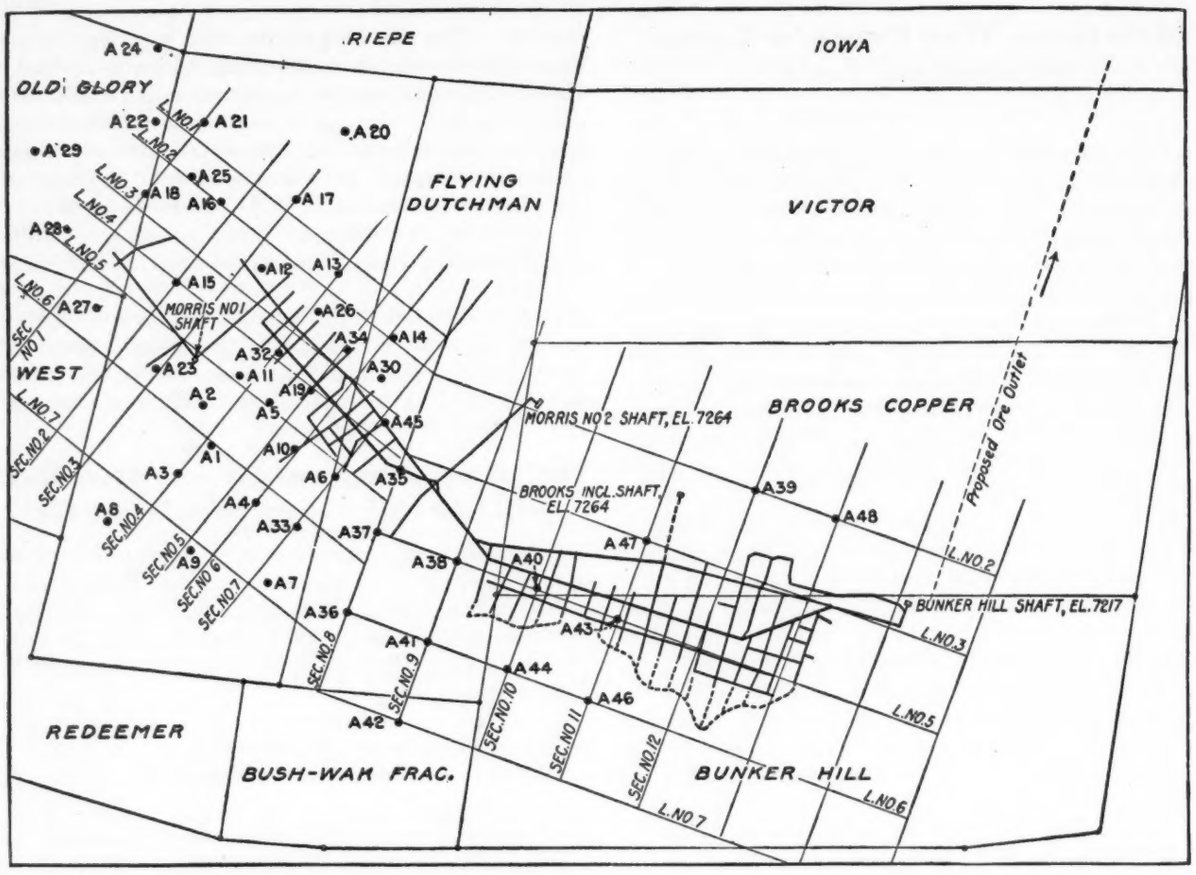
*No allowance is made for ore known to exist in the territory served by the Old Glory, Taylor, Giroux and Alpha shafts, which are inaccessible except on the 770- and 1000-ft. levels of the Giroux shaft.

It will be recalled that the Consolidated Coppermines Co. now controls the old Giroux Consolidated Mines Co., the Butte & Ely Copper Co., the New Ely Central Copper Co., the old Coppermines Co., the Chainman Consolidated Copper Co., as well as miscellaneous small groups of claims designed to give approaches to steam-shovel pits, water rights and otherwise round out the property.

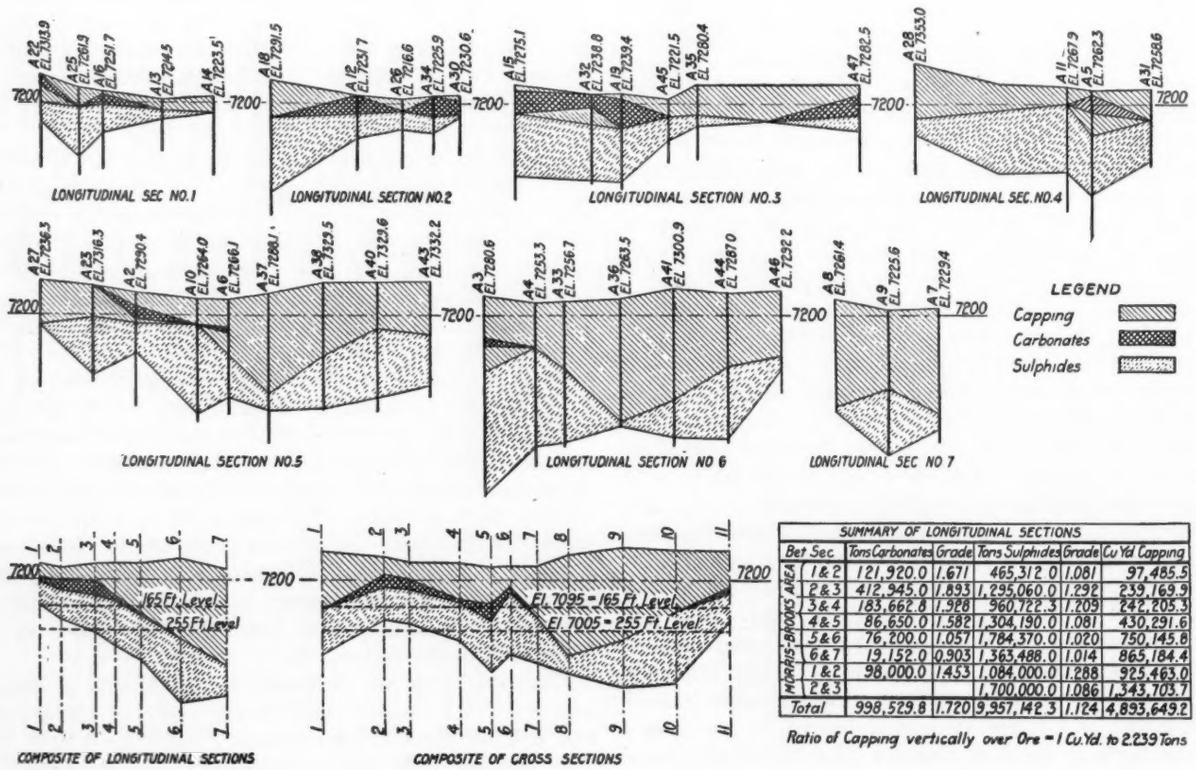
The drilling campaign began in earnest in November, 1913, and continued until Aug. 7, 1914, when drilling was discontinued owing to conditions following the outbreak of the European war. During this campaign 28,075 ft. of churn drilling was done at an average cost of $2.917 per ft., this cost including the keeping of elaborate records and samples, all of which have been carefully preserved for checking purposes.

It is planned that the ore reserves mentioned in the foregoing will be mined by steam shovel; but as the drilling so far done has not delimited the various orebodies, only the amount of vertical capping has been reported. Slopes and approaches cannot be estimated until further drilling has been done. The capping lying vertically over several of the larger orebodies is given below. It is interesting to note on the adjoining page the method the company has adopted for summarizing the results of drilling on one of the principal ore-bearing areas, known as the Morris & Brooks deposit.

Churn drilling has developed in the Morris & Brooks area 9,957,142 tons of sulphide ore assaying 1.124% Cu and 998,599 tons of carbonate ore assaying 1.72% Cu. The capping over this orebody amounts to 4,893,649 cu.yd., or 1 cu.yd. of capping to 2.239 tons of ore. Underground development from the Brooks shaft, in territory contiguous to the churn-drilled area, has proved



PLAN OF CHURN-DRILL HOLES ON MORRIS & BROOKS AREA OF CONSOLIDATED COPPERMINES CO.



SUMMARY OF LONGITUDINAL SECTIONS							
	Bet Sec.	Tons Carbonates	Grade	Tons Sulphides	Grade	Cu Yd Capping	
MORRIS-BROOKS AREA	1 & 2	121,920.0	1.671	465,312 0	1.081	97,485.5	
	2 & 3	412,945.0	1.893	1,295,060 0	1.292	239,169.9	
	3 & 4	183,662.8	1.988	960,722.3	1.209	242,205.3	
	4 & 5	86,650.0	1.582	1,304,190.0	1.081	430,291.6	
	5 & 6	76,200.0	1.057	1,784,370.0	1.020	750,145.8	
	6 & 7	19,152.0	0.903	1,363,488.0	1.014	865,184.4	
	1 & 2	98,000.0	1.453	1,084,000.0	1.288	925,463.0	
	2 & 3			1,700,000.0	1.086	1,343,703.7	
	Total	998,529.8	1.720	9,957,142 3	1.124	4,893,649.2	

Ratio of Capping vertically over Ore = 1 Cu. Yd. to 2.239 Tons

LONGITUDINAL SECTIONS OF OREBODIES DISCLOSED BY CHURN DRILLING IN THE MORRIS & BROOKS AREA OF CONSOLIDATED COPPERMINES CO., KIMBERLY, NEV.

1,000,000 tons of sulphide ore assaying 1.670% Cu.

The Emma-Nevada deposit, west of the Liberty pit of Nevada Consolidated, is estimated to contain 3,108,360 tons of sulphide ore assaying 1.006% Cu and 1,546,568 tons of partly developed sulphide ore assaying 1.008% Cu. The capping over the developed area is 661,111 cu.yd., equivalent to 1 cu.yd. for 4.283 tons of ore.

The Ora deposit, which is at the entrance of Nevada Consolidated's Liberty pit, is estimated at 1,888,865 tons of 1.344% ore and 844,000 tons of partly proved ore averaging 1%. Practically all of the capping has been stripped from this deposit. The Nevada Consolidated company mines and treats the ore as removal is required for proper grades to the Liberty pit.

These three areas account for approximately 15,000,000 tons of the company's reserves and are estimated to average 1.129% Cu. Higher grade ore has been "partly developed" by underground work at other places on the company's property, notably at the Minnesota claim, which is near the Ruth orebody of the Nevada Consolidated. As remarked in the footnote of the table, no account is taken of such ore as may have been developed in the old Giroux workings from the Alpha, Giroux, Taylor and Old Glory shafts, these workings being at present inaccessible for measuring the tonnage that may exist in this portion of the company's property.

The annual meeting of the company was held on June 8 at Wilmington, Del., 405,858 shares being represented. No opposition developed from the fiery attack made on the management recently in a circular by Col. Enos A. Wall; in fact, the management was completely sustained at the meeting, with the reëlection of Charles H. Boynton as president and most of the old officers. Four directors were scheduled to be elected; two old directors, E. F. Gray and Joseph B. Cotton, were reëlected, and the two new directors are John T. Morrow and Edwin F. Kellogg, of New York. At a subsequent meeting of the directors, Franklin E. Searle, of New York, was elected to the board to fill a vacancy.

In the annual report President Boynton directed attention to the gradual elimination of the difficulties that had confronted the executive and legal management in the merging of previously distinct and, in some cases, discordant interests. He announced that it would be the policy of the company to issue statements from time to time giving stockholders full information regarding conditions at the properties and asked that the management be supported in its development program and not afflicted with old grievances against the original companies with which the present organization is not concerned. Perhaps the most important announcement is the proposed plan to raise a fund of about $1,000,000 by the sale of bonds or other means, this sum to be devoted to the payment of indebtedness and the further development of the orebodies. The erection of a treatment plant was considered unwise at this time, both on account of the metallurgical changes now under consideration at porphyry mines and on account of the further development planned for the unexplored areas between some of the isolated orebodies already opened on the property of the Coppermines company. It is probable, however, that a small experimental plant will be established in the old Giroux concentrator to determine the most suitable process or processes for the treatment of the carbonate and sulphide orebodies.

Duty on Zinc in Ores

The Board of General Appraisers, on June 9, rejected the appeal of the United States Metals Refining Co. from a decision of the collector at New York, levying duty on the zinc contained in ore, the principal value of which was in copper. The ore in controversy contained zinc in percentages varying from 3.60% to 7.30%. Duty was levied on the zinc content at the rate of 10% ad valorem, upon an appraised valuation of 4c. per lb. Thomas M. Lane, counsel for the importing concern, argued that the ore is properly free of duty on the ground that the quantity of zinc contained in the ore is negligible and not capable of being recovered or used.

In overruling the contentions of the importers, Judge Fischer said: "In enacting paragraph 162 of the present act, it is clearly manifest that Congress intended not only to adopt as correct the judicial interpretation of the language of paragraph 193 of the act of 1909, but to further narrow its applicability and scope. Hence, we find omitted from the present paragraph this provision, 'containing less than 10% of zinc,' found in its predecessor in the act of 1909. There can therefore be no question whatever concerning the congressional intention to impose a duty of 10% ad valorem upon zinc-bearing ores of all kinds, including calamine, regardless of the quantity of zinc which may or may not be shown to be commercially recoverable."

An appeal will be taken from the board's decision to the Customs Court, and arguments will be made at the fall session.

Sulphur-Sand Cement

By E. J. Hall

Sulphur-sand cement is composed of 1 part sulphur and 1.4 parts quartz sand ground to pass at least a 60-mesh screen. The mixture is heated to about 150° C. when it flows nicely and is sufficiently above the melting point of sulphur, 114° C., to prevent sudden chilling. The fact that sulphur begins to thicken above 156° C. and becomes so viscid that it will not flow at 180° C. must be borne in mind or there will be difficulty in working the cement. This is possibly the most satisfactory general cement available for low temperature work. It is readily handled and remarkably strong, has a tenacious bond, is free from cracking and inert to most solutions. It will be found valuable for large-scale work, as well as in the laboratory. I believe it was developed by Charles S. Bradley for use in his copper-leaching process; at any rate, it was learned of through him.

French Prohibition of Lead-Ore Exports

A French ministerial decree, dated Apr. 28, abrogates the provisions of the decree of Feb. 12, in virtue of which lead ore was allowed to be exported from France without special authorization, when consigned to the United Kingdom, the British Dominions, Colonies and Protectorates, Belgium, Japan, Montenegro, Russia, Serbia and the United States of America. Applications for special permission to export consignments of lead ore to the United Kingdom will be favorably considered.

Some Steel Statistics for 1914

The Statistical Bureau of the American Iron & Steel Association has issued *Bulletin No. 3*, giving the production of various finished forms of iron and steel in 1914 and preceding years.

Structural Shapes

The production and approximate consumption of structural shapes for three years past have been as follows, in long tons:

	1912	1913	1914
Heavy shapes	2,470,415	2,553,806	1,787,281
Light shapes	376,072	451,166	243,843
Total production	2,846,487	3,004,972	2,031,124
Imports	3,120	11,659	10,145
Exports	288,164	403,264	182,395
Consumption	2,561,443	2,613,367	1,858,174

All the heavy shapes were rolled from steel. Of the light shapes, 5517 tons in 1912, 3841 tons in 1913 and 1981 tons in 1914 were rolled from iron. In 1914 there were 41 works in 10 states which rolled structural shapes.

The figures given for heavy structural shapes include all beams, tees, zee bars, angles, channels, etc., having one leg or web of 3 in. and over which were rolled for structural or fabricating purposes, while the figures given for light structural shapes include only such light shapes and small angles, etc., as were rolled for use in the manufacture of bedsteads, agricultural implements, fences, safes, vaults, or for other fabricating purposes having a section smaller than is provided for in the heavy structural classification. The production of iron and steel plates, girders made from plates, merchant bars, bars for reinforced concrete, sheet piling, etc., is not included in any of the figures given for structural shapes.

Wire Rods

The production and consumption of wire rods for three years past have been as follows:

	1912	1913	1914
Iron	1,289	832	731
Steel	2,652,264	2,463,975	2,430,983
Total production	2,653,553	2,464,807	2,431,714
Imports	15,069	16,098	6,954
Exports	64,978	61,637	61,856
Approximate consumption	2,603,644	2,419,268	2,376,812

Small quantities of copper-clad steel wire rods are included in the totals for recent years. Iron or steel wire rods were rolled in 1914 by 37 works in 12 states.

Nails

The production of nails of all kinds for three years past has beeen as follows, in kegs of 100 lb. each:

	1912	1913	1914
Wire nails	14,659,700	13,559,727	13,132,814
Cut nails	978,415	842,038	769,665
Total	15,638,115	14,401,765	13,902,479

In 1914 all the wire nails were made of steel; of the cut nails 99,682 kegs were of iron and 669,983 kegs of steel. Horseshoe nails, cut tacks and forged spikes are not included. In 1914 cut nails were made by 14 works in eight states; wire nails by 50 works in 15 states.

In 1914 there were no imports of nails reported. Exports were 885,843 kegs, leaving 13,016,636 kegs as the approximate consumption.

Plants to Manufacture Barium Compounds have been established at Charleston, W. Va., and Melrose, Calif., according to the U. S. Geological Survey.

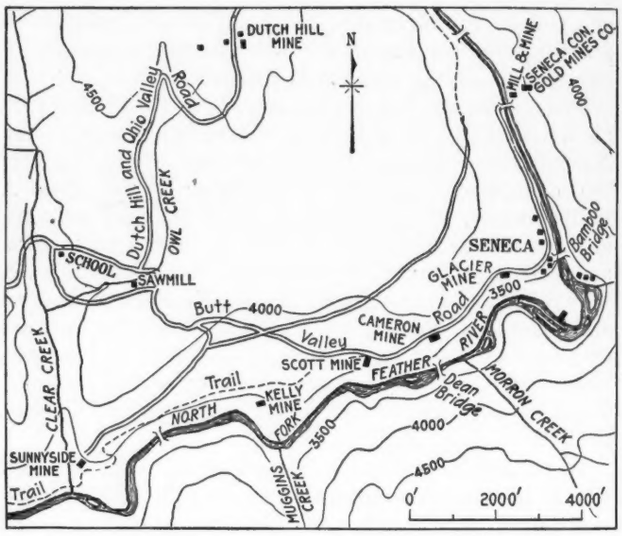
Seneca Mining District, California

By W. H. Wright*

The Seneca mining district, California, is interesting both as to mining and geological conditions. This district lies along the north fork of Feather River in the northwestern part of Plumas County, extending from Mosquito Creek to Ohio Creek, and is directly west of the Taylorsville, Greenville and Crescent Mills districts. It embraces a portion of the southeastern part of the Lassen Peak lava fields. Mining has been carried on at elevations ranging from 3000 to 5000 ft. above sea level. The bed of the north fork of Feather River has been mined from the days of the gold rush to the present time, although the work is now sporadic and done mostly at low stages of the river.

Geology of the Seneca Mining District

The auriferous slates, all more or less metamorphosed, form the country rock. These range in age from the Silurian to the Jurassic inclusive. Predominating in this field are the Calaveras of the Carboniferous era and



Sketch Map of Seneca Mining District

the Cedar of the Juratrias. These are the most productive. The earth movement which formed the Sierra Nevada folded these slates so strongly that the strata are steeply tilted and in places stand almost vertical; also, they have been broken and displaced along a series of thrust faults. Intrusions of eruptive rocks—diabase, porphyrite, peridotite and diorite—are numerous. Much quartz, more or less auriferous, is found lying parallel to the rock layers, but the richest ore deposits are found in veins in or near the contact of the slates and eruptives.

Volcanic activity of the Lassen Peak field, which began at the close of the Ione epoch (Miocene) and has continued intermittently ever since, produced great lava flows which filled the ancient and more recent river channels and at places formed dams across cañons, producing lakes which subsequently became meadows. The buried gravel channels furnish the present lava-cap drift mines.

Some of the basalts are old, but on the whole they are judged to be the youngest lavas of the district. The Big

*Mining engineer, 5494 College Ave., Oakland, Calif.

Flat channel at Seneca was filled after the river had cut a cañon through the slates and older lavas. Since then the river has cut its cañon several hundred feet deeper, leaving the gravel exposed in places under the lava along the sides of the cañon. Dutch Hill, near Seneca, is an example of Neocene gravels. These are lava-capped, and since their deposition the drainage of the country has been greatly changed. The stream which deposited them flowed northwest, while the Big Flat channel and the present river flow southwest. Dutch Hill is 1000 ft. above the present river bed and 4600 ft. above sea level. It has been estimated that this region has been elevated 4000 ft. since the deposition of the gravels. The auriferous gravels of the present river bed received their enrichment from the erosion and decomposition of the auriferous slates and from the ancient gravels.

In the vicinity of Mosquito Creek and Caribou, placer mining is being done on a small scale. On the Big Flat channel, which extends from the mouth of Butt Creek to a point a mile above Seneca where the river cuts through it, are situated several gravel mines.

SENECA CONSOLIDATED MILL ON FEATHER RIVER

A BREAST IN THE SCOTT DRIFT MINE

DRIFT MINING IN THE SCOTT CLAIM

The Scott mine is perhaps the most interesting of the drift mines on the Big Flat channel. The methods employed in the prersent development by Charles H. Grill and Frank Stokes under lease have an important bearing upon channel mining in this and similar districts. In the '90s Fred Scott, from whom the mine took its name, advanced an abandoned 160-ft. tunnel a distance of 20 ft., broke into rich gravel and extracted $80,000, when a fault cut off the gravel. The later operators drove a new 700-ft. tunnel and raised 12 ft., entering barren light wash of shaly débris. A 350-ft. drift from the raise again disclosed the fault where the gravel was very rich. The drift was continued into the bedrock for a distance of 60 ft., and a raise broke into fine pay gravel. The drift was advanced and other raises were driven at distances of 40 ft. and 60 ft.; these raises also found pay. Crosscuts are now being run from the last two raises to determine the width of the channel and to block out the ground. The fault, which is nearly at right angles to the channel, has caused a vertical displacement of 20 ft., and the line of faulting is occupied by a quartz vein of small gold content. The bedrock varies, slate, shale and limestone predominating.

Some "breasting" has been done from time to time to meet expenses. All the bedrock gravel contains gold, but the amount is variable and ranges from $2.50 to $10 per car (approximately 1 cu.yd.). The gravel is firm enough to require blasting, but breaks up so thoroughly as to offer no difficulties in washing. The ground stands well in the drifts and gangways. All of the breasts visited were from 5 to 8 ft. ahead of the timbers, and the backs showed no signs of working. The posts and caps are of split white cedar, which abounds in this vicinity, and have a cross-section of not over 60 sq.in., generally much less. Split slabs of yellow pine are used for lagging. While the timbering is light, there is no sign of squeezing or breaking even in the oldest sets. The greater part of the bedrock tunnel requires no timbering.

Briefly the system of mining is as follows: A main adit is driven in the bedrock lengthwise of the channel and under it. Raises, each of sufficient size to contain a chute and manway, are run into the gravel at short distances. From the tops of these raises gangways are driven across the channel. In these gangways about 3 ft. of bedrock is taken out with 3 to 4 ft. of gravel. The breasting is done from the gangways. Only enough gravel to allow working room is taken, as the gold lies close to and on the bedrock. As the ground is breasted the room is packed with large rock. This serves the double purpose of holding the ground and eliminating the tramming of valueless material. Ground breasted several years ago is still standing.

The gravel from the raises is trammed to the bin at the mouth of the tunnel. A grizzly over the bin separates the cobbles from the fine gravel so that they pass down a chute to the waste dump. A large tank near the bin stores the mine water for washing the gravel. Hungarian riffles are used for the first 60 ft. and then for a like distance are riffles of 2x4-in. lumber, placed lengthwise and separated by cleats of the same material. The sluice boxes are 16 in. wide and have a grade of 1 ft. in 12. The gold is coarse and no quicksilver is used. The operators have been able to meet all expense of development with the gold recovered in this work and the little breasting they have done.

OTHER BIG FLAT MINES

Other gravel mines situated on Big Flat channel are the Sunnyside, Western, Kelly, Cameron and Glacier. The Sunnyside mine is famous for production in the past. It is being reopened by Robert Costar. The Western, farther up the river, is yet only a prospect, but has disclosed some good gravel. The Kelly mine, situated above the

Western, was worked under bond last summer by W. W. Robbins and associates. The results have not been made public. The Cameron mine, a mile below Seneca, is being developed by a tunnel driven under the channel and a raise put up to tap the gravel. Gilmer brothers are the owners. The Glacier mine, a short distance below Seneca, is being worked under bond and lease by R. J. Stone. In the middle of August the tunnel had been advanced to the 1575-ft. point. Since then a raise has been driven with the expectation of finding the channel.

The Dutch Hill mine is situated about 2½ miles west of Seneca. This mine was first worked as a lava-cap drift mine and produced a large amount of gold. When the underground gravel was exhausted, attention was turned to the surface deposits of lower-grade gravel. Several hundred thousand dollars was spent in building a pipe line and ditch and installing machinery for hydraulicking. Anti-débris legislation forced a suspension of operations, with great loss to the company. Modern methods economically applied should result in reopening the property.

Lode Mines Receiving More Attention

In the Seneca district more attention has been paid to the gravel deposits than to the quartz veins, although there is one active lode mine and several promising prospects. The Dean mine, a short distance below Seneca, has recently been bonded and a contract let for development work. The property of the Seneca Consolidated Gold Mines Co., on the north fork of Feather River a mile above Seneca, consists of a group of claims and a milling plant.

The White Lily and Del Monte lode mines are being worked jointly, the surface rights of one being indispensable to both. Until last summer the property had been tied up by apex litigation, which resulted in the apex and all extralateral rights being awarded to the Del Monte. Then the mill was remodeled. It now contains 16 stamps, arranged in three batteries of two stamps and two batteries of five stamps, and three concentrating tables. Power is developed by water taken from the river. Twenty men have been employed steadily since last spring. The mine is on a quartz vein having a northwest strike. A diorite dike seems to have been instrumental in the vein formation. Records produced in the apex suit showed a production of $268,000 under the ownership and management of R. J. Dunn. The mine is peculiar owing to the fact that no blasting is required to break the ore. The vein matter is greatly crushed and partially decomposed. The principal gangue is quartz, containing a small amount of pyrites and a little galena. The square-set system of timbering is used. J. J. Riley, who is heavily interested in the property, is manager.

The climate in the Seneca district is decidedly healthful. While there is a large annual precipitation, it practically all occurs in the winter months in the form of snow. Of course, there are occasional showers during the open season, but these are not heavy and some seasons there is almost no rain. Light snows come early in the fall, but the heavy snows hardly ever start before December and generally after Christmas. The roads then are impassable for heavy hauling, and all supplies must be taken in before the snows begin. There is only one road open all winter, and that is to the Western Pacific at Keddie by Cañon Dam, Greenville and Crescent Mills. The roads are generally open for heavy hauling in May.

The country is covered with a fine growth of timber suitable for all purposes, and there is a sawmill on the Butt Valley road, 3 miles from Seneca. The Great Western Power Co. has a hydro-electric plant at the mouth of Butt Creek that was used in the construction of Cañon Dam, which converted Big Meadows into Lake Almanor. This plant is not running at present, but will undoubtedly be put in operation when the demand for power warrants.

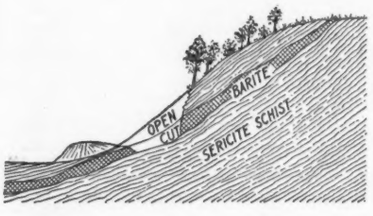
Barytes at Kings Creek, S. C.

By Joel H. Watkins*

Since the outbreak of the European war the demand for domestic barytes has been greatly increased. As a consequence, many abandoned mines and undeveloped deposits have been examined and exploited. A few of these are now being actively operated.

The Cherokee Chemical Co.'s Progress

One of the most interesting of these new developments is that of the Cherokee Chemical Co., at Kings Creek, Cherokee County, S. C. A barytes mill was erected at this point several years ago by the Cherokee company and since then small quantities of crude and floated barytes have been produced from time to time. In the past few months, however, a controlling interest in the company has been acquired by outside capital and under the new management better progress is being made. The ore occurs as lenticular veins in quartz-sericite schist. The vein matter is chiefly massive granular barytes, varying in color from pure white to a deep, rose pink. The only impurities which have thus far been observed are occasional veinlets of white quartz, small inclusions of the wall rock, and small amounts of galena, which is mostly segregated along definite lines. The vein matter usually forms a clean, sharp contact with the wall rock, though in places there is a slight gradation into the schist. The veins vary in thickness from a few inches up to 8 ft. or more and conform roughly to the strike and dip of the inclosing schist. Small veinlets forming offshoots from the larger veins are not infrequent, and often cut the structure of the wall rock. In one opencut three parallel veins, from 1 to 3 ft. in thickness, are being worked. The schists in this area form a series of folds so that the veins show considerable variation in dips. In general the strike is about N 25° E, and the dip varies from 10° to 45° where exposures were observed.



Section Showing Position of Barytes Vein and Position of Inclosing Rocks

Nature has played an important part in uncovering the barytes veins in this area, so that a considerable tonnage of ore can be won from opencuts with little stripping. The veins which are exposed for several hundred yards both north and south of the Southern Ry., a short distance east of Kings Creek, dip to the southeast and are roughly par-

*Geologist, Southern Ry. Co., 1320 Pennsylvania Ave., N. W., Washington, D. C.

allel to the slope of a hill. Near the base and at the top of the hill they are exposed by erosion, but on the slope the hanging wall, which consists of weathered schist, is from a few inches to 10 ft. in thickness. The ore is at present being mined simply by stripping the veins in open cuts and shooting the massive barytes from the solid.

The former owners of this property report that they were unable to make a clean separation of the quartz, which occurs as a gangue mineral with the barytes. The quartz which could not be readily separated was therefore ground with the rest of the ore. This high percentage of silica was not desirable, so that it was difficult to market the output of the mill. W. H. Kemler, engineer in charge of the property, has installed two jigs, which, it is claimed, successfully eliminate the quartz when the ore is finally crushed. The small portion of the vein which shows galena is easily selected by hand and is being sold as second-grade crude ore.

The ore is at present being mined from two large opencuts, one north and the other south of the railroad, and within a short distance of the mill. At the time of my last visit to the mine a large area had been stripped and the vein was showing a thickness of about 6 ft. It is not uncommon to see masses of white barytes weighing several tons being thrown down by a single shot. The mill has been thoroughly renovated and some new machinery has been installed. The company is negotiating for contracts for both crude and floated ore.

MINING BARYTES IN OPENCUT, KINGS CREEK, N. C.

BREAKING FROM 6-FT. VEIN AFTER STRIPPING

Decreased Fluorspar Production in United States

The quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in 1914 was 95,116 tons, compared with 115,580 short tons marketed in 1913.

The market for the bulk of the fluorspar sold in the United States depends on the steel industry, and when that industry becomes depressed, the demand for fluorspar quickly diminishes. Gravel spar is consumed as a flux in basic openhearth steel furnaces and to a smaller extent in other metallurgic operations. In 1914 the marketed production of gravel spar constituted about 83.3% of the total marketed output of domestic fluorspar.

The market for lump fluorspar for the manufacture of hydrofluoric acid is reported to be improving. This report appears to be confirmed by the increase of nearly 55.8% in quantity.

In Illinois the output in 1914 came from three mines, all in Hardin County. Spar was shipped from 10 mines in Kentucky (nine in Chittenden County and one in Livingston County), one mine in New Hampshire, and five mines in Colorado. The mines in Arizona and New Mexico that were active in 1913 reported that there was not sufficient demand for their product to warrant any shipments during 1914.

Library Service Bureau

The Library Service Bureau of the United Engineering Society, 29 West 39th St., New York, has been studying the problem of making the splendid reference library of the society more valuable to the members. The library receives currently 800 engineering or scientific periodicals and has over 60,000 volumes on technical subjects. It is obviously impossible for any one man to read all these papers, and the bureau proposes to furnish accurate abstracts on specified subjects and translations of articles appearing in any language, bibliographies on any engineering subject, copies of articles or photostatic prints or diagrams, maps or of printed pages, if desired. In a circular sent out recently by E. Gybbon Spilsbury, chairman of the library-service committee, a schedule of prices for this work is announced. It is proposed to issue subscription cards for the convenience of members upon receipt of $10, so that bookkeeping and the expense attending the collection of small amounts will be eliminated. Some of the charges are as follows: Reference cards, 10c. each; copying, per 1000 words, $1; translating, per 1000 words, $2.50 to $3.50; bibliographing, $1 per hour; abstracting (English), $1.50 per hour; searches for patent purposes, $3 per hour; statistical searches and reports, $2.50 per hour. This has been arranged with a view to rendering service for practically what it costs the bureau. All work of the bureau is strictly confidential. This service should be of much value to engineers who are too far away to visit the library personally, and also to those who live in the vicinity but desire to economize their time.

The Broken Hill Proprietary Co. of New South Wales started its first iron blast furnace at Newcastle on Mar. 15. The steel works are about ready, but it is proposed to accumulate a considerable stock of pig iron before starting on steel, so as to prevent all danger of having to stop in case of any mishap to the furnace.

Details of Practical Mining

The Blacksmith's Use of Borax and Cyanide*

No one knows the name of the first blacksmith who found that a bit of borax on his iron made it weld with more certainty, but we do know the importance which fluxes have in work that requires a union of metals under heat.

The action of borax as a flux appears to be one of melting in its own water of crystallization. When heated above a red heat, it fuses and makes a sort of glass which will adhere to metals even up to the welding heat and higher. It is this property of coating the surface to which it is applied at a temperature below that at which active oxidization takes place, and staying there until the welding or brazing heat is reached, that gives it its value to the blacksmith.

Various mixtures of borax with other elements are used. How much more valuable they are than borax alone is difficult to determine, because the process of welding is so dependent on the personal element that a man's judgment may be influenced by things which have nothing to do with the results obtained. One of the substances mixed with borax is sal-ammoniac. This is supposed to make a compound which will restore "burnt" steel, or steel which is sufficiently overheated to make the grain coarse and crystalline. Sal-ammoniac is NH_4Cl. Borax is $Na_2B_4O_7$ (10 H_2O) and contains no carbon, so it is hard to see just how the two together can be a restorative. It is true, however, that "burnt" steel can be improved in quality by heating nearly to a welding heat and hammering. If the directions with the compound call for much hammering and if they are followed, the material will undoubtedly be improved, though not brought back to its original composition.

Other mixtures contain iron filings as well as borax and sal-ammoniac. The value of the iron filings seems doubtful; used alone, they almost surely prevent welding. It seems likely that they must burn before the welding takes place.

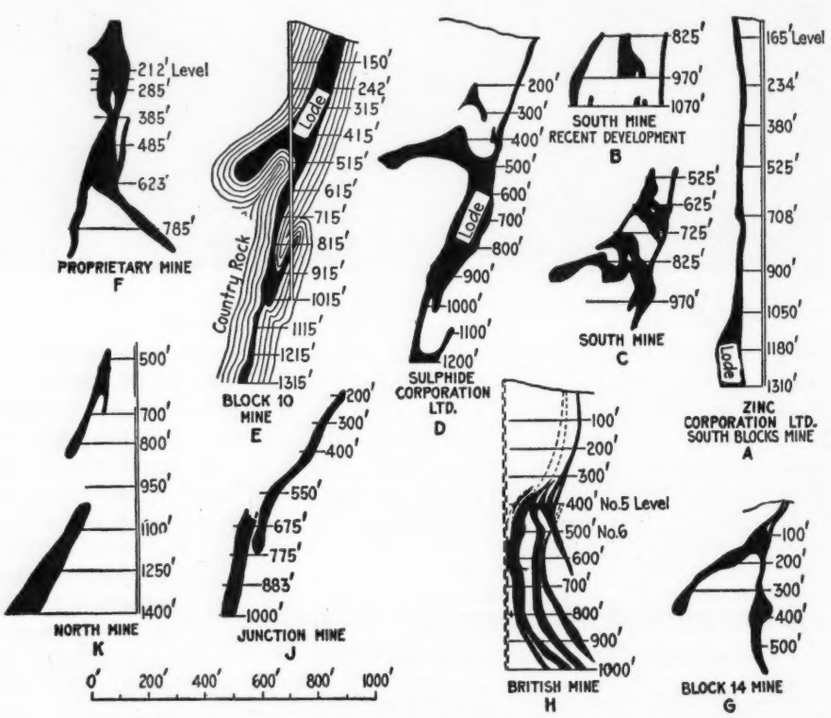
The heat treatment of steel, short of the welding point, brings into play another series of chemicals, of which cyanide of potassium is the best known. Its poisonous properties should always be kept in view, as its effect is extremely virulent whether taken internally or admitted to the blood through a cut in the skin. It is even dangerous in the cooling tank of a blacksmith's forge, though it only gets there in the small amounts carried over with hot steel. Cyanogen, $(CN)_2$, is the base of a number of compounds useful in the arts.

The action of cyanide in heat treatment is that the cyanogen is decomposed and gives up its carbon to the hot steel or iron, thus making a thin case-hardening. It also reduces oxides at red heat. For case-hardening purposes it should be kept boiling and the pieces left in it for about five minutes. It spatters badly, and the fumes are especially bad. If about 2% soda-ash is added, the fumes will be reduced.

*Abstract from "Chemicals Used in Shop Processes Requiring Heat," "American Machinist," June 10, 1915.

Mine Model of the Broken Hill Lode

A mine model 15 ft. long, representing a length of three miles of the Broken Hill lode, New South Wales, has recently been completed for the Panama-Pacific Exposition. This model differs from the ordinary mine model in that it is a model of the lode itself, or rather that richer portion of it which has been worth extracting. Wherever possible, survey sections across the lode have been obtained and similar small sections have then been cut out in wood with a fret-saw. It took 350 sections wired together in their correct positions to make the structure of this model. After securing the wooden sections firmly in place, they were covered with strips of calico brushed over with hot glue; the whole was then painted. The purpose of the ordinary mine model is to show the workings of the mine. The object of this one apparently has been to show the



Cross-Sections Along the Broken Hill Silver Lode

MINE MODEL OF BROKEN HILL LODE

lode as it was before being mined, as has been proved by the workings during the time in which it has been mined.

The accompanying illustrations show various cross-sections along the Broken Hill lode, taken from plans supplied by the various mine managers and communicated to the JOURNAL by E. F. Pittman, Government Geologist and Under Secretary of Mines, Sydney, New South Wales. These sections are indicated by letter on the illustration showing the mine model as exhibited. *A* shows a section of the main lode, the thick portion at the bottom being a ridge of ore on the western side pitching from north to south. The isolated saddle seen in *D* is connected with the main lode on the east, both north and south of this section. The portions left white between the dark lines on *H* consist of rhodonite and quartzite; they are really portions of the lode proper, but not worth working. At *E* is shown the main lode or fracture following the course of the limb connecting an anticlinal and synclinal fold. This may be considered as a fairly typical section, illustrating the true nature of the lode.

The importance of Broken Hill as a mineral producer is evidenced by the 1913 output of silver-lead-zinc, which amounted to nearly $30,000,000, a result largely to be attributed to the flotation process.

A Compressed-Air Meter

The need for a device for measuring the air consumption of air drills has long been felt. The usual methods used for measuring this air consumption have been either expensive or cumbersome, with the result that very few mines are ever able to test the air consumption of their various machines, much as they would like to do so.

A new device for accomplishing this purpose has just been put on the market.* This device, shown in Fig. 1, is not only simple and inexpensive, but takes advantage of a well-known law in such a way that there is no complication of moving parts to wear and get the instrument out of adjustment.

The French scientist Poncelet deduced the law, which briefly stated is: The volume of a definite compressed fluid or gas flowing under small constant head through multiple orifices of the same shape and size is directly proportional to the number of orifices exposed to the flow.

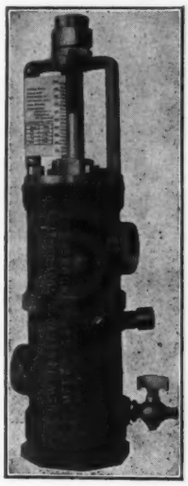


FIG. 1. COMPRESSED-AIR METER

Reference to Fig. 2, which shows a section of this device, will make the operation of this meter clear. The device consists of two parts, a housing with inlet and outlet flow for the compressed air to be measured and a moving element inside, which consists of a weighted piston *P* loaded with the weight *W* in the upper or metering cylinder; a small piston in the oil dashpot below; and a rod joining these two pistons and extending upward, where it moves freely without contact, inside the sight-glass at the top of the meter. This rod rises and falls with the pistons, so that its height in the sight-glass corresponds exactly to the relative position of the piston in the metering cylinder, which corresponds to the volume of air flowing. A scale plate mounted against the outside of the sight-glass permits reading the exact height of the top end of the rod.

Air enters at the lower left-hand opening *A* into the chamber surrounding the dashpot cylinder and passes through ported openings into the interior of the metering cylinder *C*. The wall of this metering cylinder is drilled with a large number of small holes accurately reamed and uniformly spaced—only the holes in the plane of section are shown in the cut. To pass to the outlet chamber *D* the air lifts the piston and exposes some of the holes to the flow. The throttling effect on the air in passing through these small orifices reduces the pressure in the chamber *D* slightly below the pressure in chamber *C*. This small difference in pressure is counterbalanced by the weight of the loaded moving element described, when it has risen high enough to give proper port opening to the required flow of air. It is the floating of the moving element, due to the varying amount of air flowing through the port, which indicates on the graduated scale the cubic feet of air flowing through the instrument.

If the meter is connected to an air line and the valves are opened suddenly to the full pressure, the moving element will rise from its lowest position to the top, but it

*By the New Jersey Meter Co., Plainfield, N. J.

will not go to the extreme limit of its travel unless the volume of air flowing is in excess of the rated capacity of the meter. In the latter event, no harm would be done to the meter, but of course a reading could not be taken, because the indicator would be off the scale.

This is not a velocity meter which will give readings proportional to the square of the volume flowing, but is a direct-volume gage with a uniform scale on which one cubic foot is represented by the same distance whether working at high or low capacity. The loss of pressure due to the throttling in passing through the metering device is so slight that it cannot be detected by a gage, and the meter cannot be injured by a flow in excess of its metering capacity. There are no leather pockets, rubber or leather disks, bearings, gears, valves or other parts which can develop defects to change the accuracy. The use of bronze parts prevents corrosion or rusting.

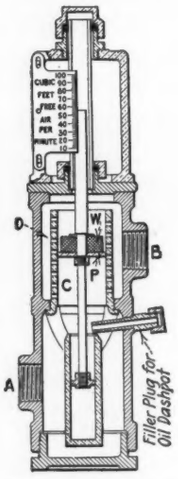


FIG. 2. SECTION THROUGH AIR METER

The size of the instrument is very handy, it being only 12 to 18 in. high and 2 to 3 in. in diameter, and costs less than $100. It is manufactured in two sizes, the 1-in. meter being called the Tool-om-eter, with a capacity of from 10 to 100 cu.ft. per min., and is recommended for small tools, including chipping and riveting hammers, plug, hammer, and stoping drills, wood-boring and metal-drilling machinery, rated by manufacturers at not over 60 cu.ft. per minute when new. The 2-in. size is called the Drill-om-eter, with a capacity of from 50 to 300 cu.ft. of air per min., and is especially adapted to rock drills, coal punches, diamond drills, hoists, pumps, etc., where the actual consumption is not over 300 cu.ft. per minute. Larger sizes of meters are manufactured to meet exact requirements.

Relocation of Washington Mining Claims

BY A. L. H. STREET*.

Under the mining laws of Washington, a notice of relocation of a quartz or lode claim must show on its face whether the claim is located as forfeited or abandoned property, according to the decision of the Supreme Court of Washington lately announced in the case of Florence-Rae Copper Co. vs. Kimbel, 147 *Pacific Reporter,* 881. It is insufficient, the court holds, to give that information in the statutory certificate recorded with the county auditor.

Another point decided in the same case is that, in order to sustain a relocation, one seeking to avail himself of a preceding locator's failure to do required assessment work must establish the failure and the relocation by clear proof, since courts are disinclined to decree forfeitures of property rights.

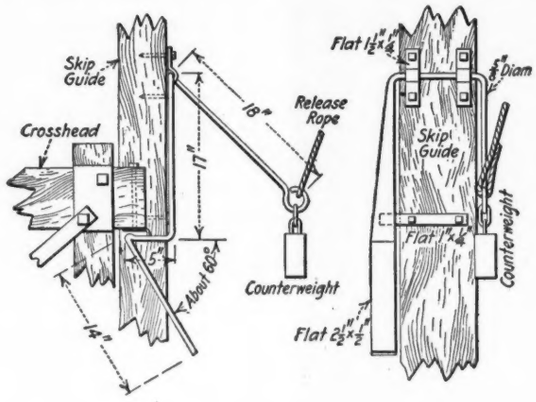
The Supreme Court further holds that making of large expenditures by a mining company, which had made an original location, in preparing trails and cable lines leading to its claims, constituted such resumption of work as precluded a subsequent valid relocation.

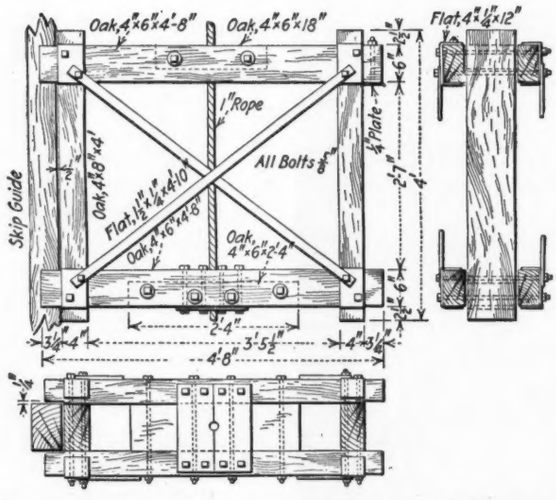
*Attorney, St. Paul, Minn.

Incidentally, it is declared in the opinion in this case that since the matter of disposing of mining ground is within the control of the Federal Government, state regulations providing for giving of location notices, etc., must be regarded as mere peace regulations, rather than as affecting titles to mining property.

Crossheads for Bucket Hoisting

In many states the law requires the use of a crosshead when hoisting a bucket in a shaft, and also some device to prevent accident owing to the crosshead hanging up on the guides and subsequently dropping on the men riding in the bucket. The accompanying illustration* shows a satisfactory crosshead which was used during the sinking





UPPER CROSSHEAD STOP AND HOISTING CROSSHEAD

of a shaft on the Mesabi Range. Short pieces of rope should hang from this crosshead so that the men can hold to them when riding in the bucket. This would prevent any slight cause from hanging up the crosshead, and if it did hang up, would warn the men in time for them to take proper precautions.

The illustration also shows the upper crosshead stop, which is used on the headframe to hold the crosshead out of the way while the top lander is dumping the bucket. This stop has to be released by pulling on the rope shown and lifting the counterweight.

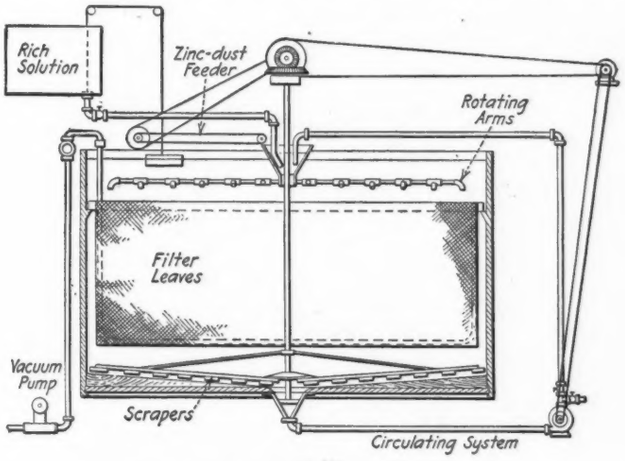
*From "The Wisconsin Engineer," April, 1915.

Details of Milling and Smelting

Precipitating Apparatus for Use in Cyaniding

A system of precipitation (U. S. pat. 1,123,778) has been devised by Louis D. Mills, now of Johannesburg, but formerly of San Francisco. The patent is assigned to the Merrill Metallurgical Co., of San Francisco. The distinctive feature of the process is the maintenance of a homogeneous mixture of the pregnant solution and mobile precipitant at the surface of the filtering medium, so that as the solution is passed through the medium the precipitant and precipitates are deposited on the filter as a homogeneous and uniformly permeable cake. Such homogeneity of the mixture is maintained by continuously circulating it.

The accompanying illustration shows a typical installation for carrying out the process. There is a tank containing a number of filter leaves disposed vertically



ZINC-DUST PRECIPITATING SYSTEM

to facilitate circulation. These leaves are connected with a vacuum pump, such as is usual in vacuum filtration. A circulating pump is also provided, drawing from the bottom of the tank and delivering into a hopper at the top. The hopper connects with a set of rotating arms, which are above the line of the filter leaves, but below the surface of the solution in the tank. The bottom of the tank is made slightly sloping and is provided with arms and scrapers to prevent the settling of precipitant or precipitate upon the tank bottom. A source of pregnant solution supplies the hopper over the tank through a pipe, and the precipitant is fed in with it. The pregnant-solution pipe and the circulating-solution pipe enter the hopper below the level of the solution in order to prevent oxidation.

The operation of the process is evident. The precipitant and pregnant solution are added at the hopper, agitated in the tank and passed down through it. The precipitant and precipitate are partly removed in the form of a cake on the filtering surfaces, while the circulating pump keeps the solution and remaining solids in movement constantly, thus promoting precipitation. When a cleanup is desired, the entry of solution and precipitant is cut off and the tank emptied as far as possible by pumping the solution through the filters. Then the cake on the leaves is flushed off into the bottom of the tank and pumped to the drying press.

Testing Oils for Flotation*

It has long been recognized that a well-equipped experimental testing laboratory is necessary for the successful working of a flotation concentrating plant. Of the many various tests which are required from time to time, the most frequent and perhaps the most important is the testing of oil, or active floating medium. The following remarks refer chiefly to eucalyptus and resinous oils:

The first material necessary is a standard ore sample. For the purpose of oil testing, a thoroughly representative sample of the material to be treated is dried, crushed to pass 60 mesh and bagged. For convenience, a supply ready for use may be weighed off in 1-lb. lots and put up in small tins.

A sulphuric acid solution, containing 405 gm. of H_2SO_4 per liter, is generally used, 1 c.c. of such a solution containing 2 lb. of pure acid per ton, when working on 1 lb. of ore sample.

A standard oil sample is that oil which has been found to fully meet the requirements of the proposition, upon which all future calculations are based and comparisons made. It may be stored ready for use in bottles.

Preliminary Examination

For specific gravity tests hydrometers reading to 0.001 are required. In all cases it is necessary to ascertain the specific gravity of the oil, with the view, at least, to future calculations. This may be carried out at any suitable temperature which has been fixed upon as standard. It has been found advisable to check the specific gravity of the standard oil simultaneously because of the gradual increase in specific gravity which takes place owing to the loss of lighter oils by volatilization. A correction for temperature is made by allowing 0.00045 for each degree Fahrenheit.

A small burette is used for counting the number of drops in 1 c.c. of the oil, also for admitting the oil to the machine during testing operations. The greater the number of drops delivered by the burette, the greater is the accuracy of the test. To obtain a suitable dropper, cut a burette about 8 in. above the cock, almost close the discharge orifice by dumping up the glass with a blowpipe flame, then grind the outside back to a point so that a minimum surface is presented to the oil drop. The burette should at normal temperatures give between

*Excerpts from an article by J. Coutts, in "Aust. Min. Stand.," Apr. 8, 1915.

80 and 90 drops per cubic centimeter, when run at the rate of 1 drop per second. The temperature of the oil during the dropping test should correspond with the temperature during the flotation test.

Having obtained the number of drops per cubic centimeter and the specific gravity, it is easy to calculate the number of pounds of oil per ton of ore, when working on 1 lb. of sample. Thus $\frac{2240 \times sp.gr.}{453.6 \times drops\ per\ c.c.} = lb.\ of\ oil\ per\ ton.$

It is sometimes desired in practice to use a mixture of oils. When the oil under examination is to be used in conjunction with other oils, these should be wholly miscible in the proportions in which they are to be used.

The following classification and explanations will serve to give a general idea of the methods employed when carrying out various tests: (1) Flotation of lead, zinc and other sulphides, as a mixed concentrate; (2) differential separation, or selective flotation of one sulphide in the presence of other sulphides (the term "differential separation" is usually applied to the selective flotation of lead sulphide from zinc and other sulphides); (3) flotation of copper and iron sulphides.

Outline of Test Process

The testing of oils in the laboratory is carried out by comparing measured quantities (from 3 to 6 drops) of a standard oil, with a similar quantity of the oil under examination, the values being arrived at by comparing the results obtained from each series of tests. Tests are usually made on 1 lb. of standard ore sample in 4 lb. of water at a standard temperature, acidulated with a definite quantity of sulphuric acid. The oil then being admitted, the mixture is agitated in a specially constructed agitating machine, the principle of which is dependent on the object of the test. The float produced is skimmed off, dried, weighed and assayed.

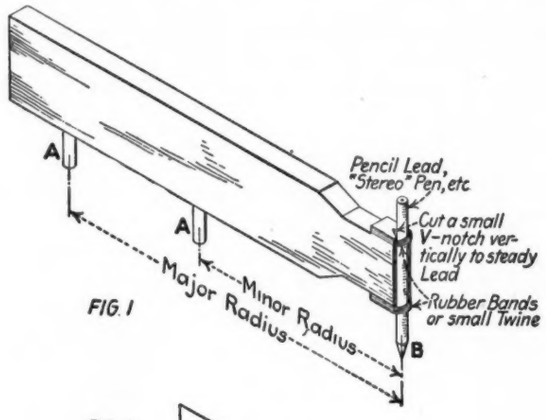
Test 1. The Flotation of Mixed Sulphides.—Almost any eucalyptol oil which produces a persistent froth and leaves a gummy residue on evaporation is suitable for this class of work. An agitating machine may be constructed by cutting a packing bottle about 10 in. above the neck (a bell jar of suitable dimensions can be obtained). Fit four copper baffles, 4x1½ in. wide, to a copper band of the same width and push this arrangement hard down into the bottle (the band being first bent to fit the inside circumference of the bottle). The lower ends of the baffles will jam hard at a point where the concave glass begins. The band is then expanded hard against the glass and held in position by soldering the separated ends. The mouth, or discharge end, is closed with a rubber stopper, through which is passed a glass or metal tube fitted with a short rubber tube and clip. The bottle with the baffles in position is inverted and clamped centrally under two pairs of suitable bearings, which carry a ½-in. impeller shaft. At the upper end of the shaft is fitted a driving wheel, and at the lower end a four-bladed impeller which just has clearance between the lower points of the baffles and the glass. The blades of the impeller have a lateral angle of about 45° and should be driven at about 1200 r.p.m. in a lifting direction.

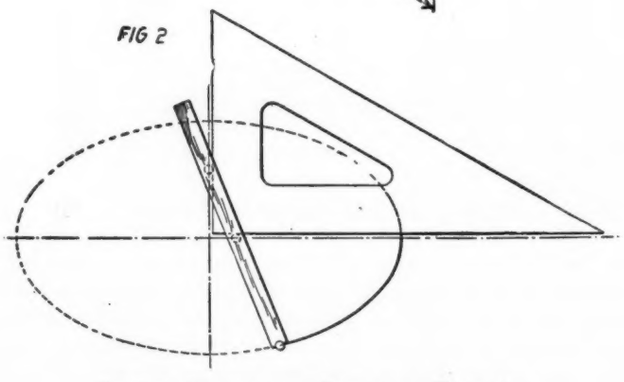
Test 2. Differential Separation.—For differential separation, an oil high in phlanderene which leaves a gummy residue on evaporation is used. Phlanderene may be tested for by a polariscope. Differential separation is worked in acid and neutral and in hot and cold liquors, and being still in its infancy, allows of many types of machines and schemes. Each different ore requires some modifications, but the principal in main is the addition of medium and aëration from below, which is effected by air jets or suction created by the impeller.

Test 3. Flotation of Copper and Iron Sulphides.—An oil which gives a deflection by the polariscope of 60 or over is considered sufficiently high in phlanderene for use in copper flotation. Tests are usually made with the apparatus described in Test 1, using cold circuit liquors made slightly acid. In practice the mine water usually contains sufficient acid for the purpose.

Simple Method of Drawing Ellipses

To many draftsmen the drawing of ellipses seems to be a troublesome job, says *American Machinist.* In Fig. 1 is shown a simple ellipse trammel for this purpose.





Simple Method of Drawing Ellipses

This is made from soft wood about $\frac{3}{16}$x¾x12 in., which size will be found to cover almost all work where it is required.

A little care should be taken to get the two points *A*, which the made from phonograph needles, and the tracing point *B* in practically a straight line. In shop work, a scriber, or metal point, may be substituted for the lead point shown.

The manner in which the trammel is used is illustrated in Fig. 2.

The Ash in Coal Will Fuse below 2550° F., according to John H. K. Burgwin ("Journ. Ind. Eng. Chem.," August, 1914), if the coal contains over 3% of iron plus sulphur.

Company Reports

Butte & Superior in 1914

The report of the Butte & Superior Copper Co., Butte, Mont., for 1914, shows a net increase in assets of $365,478 after all expenditures, including dividends amounting to $611,908. The company is to be complimented on the completeness of its financial statements given in the report. This elucidation is accomplished by the addition of a plain statement or analysis of the net increase in quick assets or "working capital" such as the JOURNAL has been making from time to time for the benefit of those who do not readily understand the meaning of the conventional financial statements given out by some of these large companies. Looking at this statement one may see at a glance the differences between the reported net income from operations and the earnings actually available for dividend payments. A summary of the statement given is reproduced herewith:

DETAILS OF NET INCREASE IN WORKING CAPITAL DURING THE YEAR

Increases:		
Net income from operations (see income account)		$1,417,128
Capital stock issued less bonds converted		3,982
Premium from sales of capital stock		10,023
		$1,431,133
Applied as follows:		
Properties	$211,262	
Investments	49,751	
Deferred charges	177,959	
	$438,972	
Dividends paid	611,908	
Taxes for 1913	14,775	
		1,065,655
Net increase		$365,478
Working Capital		
Ore on hand		$2,359
Shipments in transit, estimated		197,035
Material and supplies		180,813
Accounts receivable		13,278
Prepaid insurance		1,471
Cash		874,677
		$1,269,633
Current liabilities		111,385
Working capital		$1,158,248

Income Account, 1914

	Amount	Per Ton Treated
Income:		
Sales of zinc and lead concentrates and residues	$4,037,647	$11.876
Less freight	799,233	2.862
	$3,238,414	$9.014
Operating costs and expenses:		
Mining 326,686 tons	$1,062,345	$3.094
Milling 327,210 tons	709,834	2.693
Other charges	73,323	.069
Total operating costs and expenses	$1,845,502	$5.856
Net profit	$1,392,912	$3.158
Other income	24,215	
Net income	$1,417,127	

The company now owns 27 claims with an area of 164.7 acres and undivided fractional interests in nine claims having a total area of 58.3 acres. Surface rights to 12 acres were purchased to provide for impounding tailings. During the year 16,796 ft. of development work was performed, consisting of 7432 ft. of drifts, 7842 ft. of crosscuts and 1522 ft. of raises and stations. Total development to date, exclusive of old, inaccessible workings, was 55,671 ft. Stoping operations have now probably exhausted ore to a point 120 ft. above the 700-ft. level. A considerable amount of development work was done eastward from the shaft on the 1500-ft. level, and it is stated that a part of this proved fully up to expectations.

It is stated that only sufficient development work was undertaken to maintain substantially the existing tonnage of ore reserves, and an estimate of ore actually blocked out at the end of the year shows about 1,030,000 tons averaging 20% zinc and 7 oz. of silver. This is a decrease of about 20,000 tons during the year.

There were 326,686 tons of ore mined during the year at an average cost of $3.20 per ton, including all expenses for development work directly connected with mining and blocking out ore reserves, but exclusive of exploration work on outlying claims. The mill treated 327,210 tons of ore compared with 269,940 in 1913. The actual operating time during the year was 10 months, due to a shutdown; otherwise the mill would have treated about 400,000 tons. The following table gives the average assay value and details of metal contents in ore and concentrates:

	Gold, Oz.	Silver, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.
327,210 tons crude ore:					
Average assay.	0.0196	9.5315	0.2015%	1.340%	18.5730%
Total contents.	6,401.01	3,118,810	1,318,336	8,770,222	121,545,158
101,411 tons zinc concentrates:					
Average assay.	0.0504	25.4288	0.4774%	2.436%	53.1642%
Total contents.	5,110.49	2,578,758	968,185	4,941,850	107,828,679
2972 tons lead concentrates:					
Average assay.	0.0716	40.512	0.298%	46.432%	13.721%
Total contents.	212.64	120,385	17,708	2,759,521	815,441

The mill recovery for the year averaged 88.71% compared with 86.43% in 1914. The average milling cost was $2.12 per ton compared with $2.69 in 1913. Operating costs for 1915 are expected to be about the same as during 1914, although there are some prospects of improvements in milling costs.

Old Dominion

The Old Dominion Copper Mining & Smelting Co., Globe, Ariz., reports a production of 30,210,361 lb. of copper, 148,459 oz. of silver and 3308 oz. of gold from ores smelted in 1914. Of this production, 17,816,284 lb. of copper, 33,311 oz. of silver and 602 oz. of gold came from Old Dominion ores and the remainder from custom ores. The total amount received for the metals from company ore was $2,473,582; the profits from the treatment of custom ores, $200,623, and the total receipts, $2,674,205. Expenses at Globe were $1,431,654, and refining, commissions, transportation, taxes and other expenses were $264,042, making the total expenses $1,695,696. The net earnings for the year were $978,509. Depreciation on plant amounting to $570,750 is not included in the figures just given. Dividend payments were $445,500, making total dividends to date $3,807,000. The mines produced 129,813 tons of ore, averaging 7.44% copper, and the mining cost was $5.20, compared with a cost of $4.78 in 1913. Development work totaled 15,665 ft. The average flow of water in the mine was 3,350,000 gal. per 24 hr. Power costs for 1914 were $68.81 per hp.-year, compared with $71.02 per hp.-year in 1913. The concen-

trating plant treated 151,893 dry tons of ore averaging 4.67% copper at a cost of 93.2c., compared with a cost of 87.8c. in 1913. Deducting oil-flotation experimental expense in 1914, however, the cost of concentration was about the same as during the previous year.

A 16-box 300-ton Minerals Separation oil-flotation machine has been installed on the lower table floor of the mill. The operations to date have increased the saving of copper, and still better results are looked for. The concentrates made on these machines are difficult to settle by ordinary methods, and an Oliver filter will be installed to filter the material. The smeltery treated 207,595 tons of charge at an average cost of $2.669 per ton of new charge. The cost of converting per ton of fine copper produced was $5.65. A 12-ft. converter shell, that was put into service in July, 1913, has produced 23,350 tons of copper, which is an extraordinary performance. The cost of producing fine copper was 8.22c. per lb., after deducting silver and gold values and profits from treatment of custom ores. These costs include taxes and Boston office expense.

Milling at the Tonopah Belmont Plant

The Tonopah, Nev., plant of Tonopah Belmont Development Co. has been in continuous operation in 1914, during which period 181,424 tons of ore was milled. The average content of this ore was 22.3 oz. silver and 0.2336 oz. gold, a total of $16.721, counting the silver which was sold at 50c. per oz. The stamps reached 93.83% of their possible duty. The average tonnage per stamp-day was 8.88 tons, and the average daily tonnage, 499.8 tons.

OPERATING COSTS AT THE BELMONT MILL
Mar. 1, 1914, to Feb. 28, 1915

	Amount	Per Ton
Crushing and conveying	$12,322.83	$0.068
Stamping	55,836.04	.307
Classifying	3,995.54	.022
Tube milling	66,051.37	.364
Thickening	9,976.43	.055
Concentrating	14,138.23	.078
Agitating slimes	149,045.52	.821
Filtering and discharging slimes	31,006.94	.171
Precipitating	24,342.65	.134
Assaying	2,561.40	.014
Refining	7,702.38	.043
Lighting	1,862.46	.010
Shift bosses	6,460.54	.036
Watchmen	2,097.50	.012
Surface and plant	3,784.74	.021
Total direct cost	$391,184.57	$2.156
Administration	$10,200.00	$0.056
Office and storehouse	2,740.47	.015
Taxes and insurance	9,438.44	.052
Depreciation	50,000.00	.276
General expense	1,622.05	.009
Total indirect cost	74,000.96	.408
Total milling cost	$465,185.53	$2.564
Dry tons milled	181,424	
Labor, per dry ton		$0.419
Miscellaneous and superintendence, per dry ton		1.726
Power, per dry ton		.419
Total		$2.564
Average number of stamps dropped daily	56.3	
Tons per stamp	8.88	

The direct milling cost was $2.156 per ton, and the indirect cost, $0.408 per ton. The cost of production per ounce of doré was $0.123. Better mill efficiencies than were obtained last year are indicated by this comparison, since the gross metal content of the ores was about 15% lower. The average extraction on tonnage milled was 95.78% of the gold and 91.81% of the silver, or a combined extraction of 92.99%. The average extraction is somewhat less than last year, several reasons accounting for the fact. Among them was the more refractory nature of the ore, which contained much more sulphides of the base metals.

The old plant at Millers has been operated continuously throughout the year, with the exception of six days in November, when operations were stopped while changing to a new process. During the year 44,692 dry tons of ore was treated, with a resulting profit of $24,344. The production was 1,031,745 oz. of silver and 12,468,927 oz. of gold. Because of unsatisfactory results in extraction and operating costs, the mill was reconstructed during the year and the process changed from filtration to the continuous counter-current decantation process. The cost of reconstruction was $24,930. A contract was entered into with the Jim Butler Tonopah Mining Co., whereby that company, in consideration of a reduced treatment charge, refunded the capital expenditure for alterations as above at the rate of 50c. per ton milled. Under this contract, the Jim Butler Tonopah Mining Co. receives for the ore treated at Millers the actual recovery of metals made at the actual prices at which the products are sold, and pays treatment charges equal to the actual direct and indirect milling costs plus 5%. During the last three months of the year, the period of operation of the contract, 10,503 tons of ore have been treated under it at a profit of $3807.

During the first nine months of the year, while the filtration process was in operation, the mill treated 34,189 tons of ore. On this tonnage an average extraction of 87.45% was made at a total operating cost, direct and indirect, of $4.034 per ton. In January, 1915, with the new process in operation, but as yet not properly tuned up, the extraction became 90.05% and the total costs were $3.766 per ton. The economy of the new processes is thus indicated at about 2.6% in extraction—47c. per ton on $18 ore—and about 27c. in operating costs. It is probable that with the new process tuned up, a saving of 80c. per ton will be attained. The accompanying table shows in detail the costs incurred in ore treatment at the Belmont mill in Tonopah.

Centennial Copper Co.

The Centennial Copper Co., Calumet, Mich., reports a loss of $3213 for 1914 on a production of 2,287,130 lb. of copper, sold at 12.111c. per lb., and miscellaneous earnings of $5025. There was a balance of $24,634 in assets after the close of the year's business. The mine was put on a three-quarter basis following the outbreak of the European war, but on Dec. 1 full time was resumed at lower wages. On Feb. 1, 1915, the wages were raised to the rates in force prior to the cut of Dec. 1.

The following table gives the operating record of the Centennial for the last four years:

	1911	1912	1913	1914
Tons of rock treated	86,543	106,517	85,443	138,136
Yield, pounds of refined copper	17.26	16.36	18.87	16.56
Cost per pound of refined copper (in cents):				
Mining, milling and transportation	10.38	11.74	11.55	11.10
Construction	....	....	....	....
Smelting, freight, commissions, etc.	1.43	1.32	1.37	1.11
Interest	.43	.40	.46	.35
Total cost per pound	12.69	13.46	13.38	12.56
Development work included in above costs:				
Shafts	....	203	135	....
Openings, etc.	2639	2404	1326	2278
Percentage of hoisted rock discarded	0.214	1.041	5.986	0.671

Correspondence and Discussion

The Five-Hole Cut

Noting the discussion by H. A. Morrison of "The Five-Hole Cut," we have thoroughly tried the well-known approved methods and have found them lacking. Contrary to our expectations from experience gained in widely diverse mining camps, we have concluded that the "five-hole burn cut" is most practical for the rock and ore at Franklin, N. J. The rock is a highly crystalline white limestone which seems very resilient and tough, and resistant to the shocks of drilling and blasting. It does not lend itself to "bulldozing" or even mammoth blasting with churn-drill holes in quarrying operations, and the ore possesses similar mining properties. Although many types of V-cuts, cone cuts, draw cuts and side-round cuts have been tried, their success has been indifferent unless they have been placed with an accuracy not reached in practical mining. The V-cuts will shoot only several of the collars of the holes or else burn their bottoms if the spread of the holes at their collars is much less than the depth of the round which is expected. If a raise is made 6½ ft. wide, it will be possible to get a spread of holes of only about 2.9 ft. if the cut holes meet 5 ft. in advance of the face, and about 3.2 ft., if they meet 6 ft. in advance, providing a standard air-feed stoping drill (of about 56 in. minimum length) is used with a 2-ft. starting drill; the ratio of cut spread to round depth is thus about 58% and 53% respectively, which is too slight to permit breaking the Franklin ground.

The general theories and practices of concentrating the explosive at the bottoms of the drill holes do not produce as satisfactory results in the ore and rock at Franklin as the uniform distribution of explosive. The uniform distribution is obtained by drilling the holes of as small a diameter as is practicable in order to get the requisite strength of drill steel and the necessary changes in gages, thus distributing the explosive throughout a considerable length of the drill hole. Often, less room is left for tamping (or "stemming") than the space occupied by the explosive, which is contrary to the usual recommendations of explosives engineers; but other factors, recognized by a few explosives experts, should be taken into consideration. A gelatin dynamite is used, as this shows the highest rate of detonation of the various dynamites. So, when No. 6 or No. 8 detonators are placed in the sticks nearest the collars of the holes, their effect produces a compressive force upon the remaining explosive in the hole, while, because of the high rate of detonation, a lesser amount of tamping will produce the same explosive efficiency gained with more tamping from a dynamite of lower detonating velocity. Also, the crystalline particles of ore at Franklin, with their high specific gravity, form an unusually effective tamping medium, since their inertia is great and the interlocking of grains offers great resistance to sudden displacement. After extensive working tests of various ammonia, nitroglycerin and gelatin dynamites from 40% to 93% nitroglycerin and 7% guncotton (or approximately 110% straight-dynamite equivalent strength), the 50% low-freezing gelatin dynamite was adopted. This proved as effective as the 60% and much better than the 40% or mixed 40% and 60%.

It seems quite possible that the rate of detonation of an explosive used in blasting drifts and raises plays a more important part than is usually realized. Although two different explosives may have the same total power liberated by detonation as shown by tests with ballistic pendulums or Trauzl lead blocks, the initially applied forces may not be equal; and if one exerts sufficient initial force to strain the rock to its elastic limit for a considerable distance and the other does not, the shattering effect will be widely different. The expulsion and propulsion of rock masses is in general not a very useful type of work in mining solid rock; therefore, the shattering effect of an explosive should be chiefly sought. It also seems probable that for any given rock there is an economic limit to the useful work accomplished by a stronger explosive of the same rate of detonation, as well as by one with an increased velocity of detonation, providing the rock is well shattered by an explosive of less strength or a slower rate of detonation. In fact, there appears to be an open field for much research in regard to the adaptation of explosives to blasting rock, bearing in mind always that the useful work accomplished is not necessarily measured by the laboratory methods in vogue.

In regard to Mr. Morrison's criticism of raising rounds at Franklin, we can express no surprise over his holding such views, for general experience elsewhere would tend to support them. His error is merely in failing to realize that "there are more things in heaven and earth, Horatio, than are dreamt of in your philosophy."

B. F. T.

Franklin Furnace, N. J., May 13, 1915.

Science vs. Dreamland

Following up the shaping of the ingot of argumentative monologue (which was first cast by a gentleman who asserted that science has never made a fortune, but that business has), permit me to hammer, as I chant the "Anvil Chorus."

One underlying cause of popular misconceptions regarding scientists is the fact that many people who get the credit for being scientists are merely rank imitations. They are simply "business men" in the sense that *business* means the act of being busy trying to convince other people of what one wants said people to believe.

If the victims believe and are contented, successful business results. If money passes, the proceeding may be characterized as "successful practical business."

Some of the phony scientists are cruising to Dreamland and back again. Those who fail to get back with regularity are given machinery nicknames, such as "eccentric," "nut," etc. Some of the most successful pose as squirrel-food simply for pure joy or for the coin which eventually comes their way.

The point is this: There have been, and there still live, many scientists and fractional-scientists who have set out to investigate the things which were discovered in Dreamland. The idea has been to learn the truth about them. When the truth is found and classified so that the ordinary business men can understand it, science becomes of practical advantage to humanity.

But if a scientist is engrossed with the idea of chiseling his own name on the tablets of fame, he often forgets to tell the world enough of the truth to make his experiments serve any real practical purpose.

Suppose a scientist takes a microscopic quantity of metal and conducts an elaborate series of tests which yield nine solid pages of complex mathematical formulæ which fail to interest even the fellows of his Royal Society. The quantity of material involved in the experiment is so tiny that a chemical analysis is out of the question. Other scientists, who are too lazy to analyze the equations and too polite and too ethical to question the accuracy of the final values for the pollywog and pothook symbols, put on their tortoise-shell lorgnettes and look wise as they nod approval.

The result is that the libraries are glutted with a nauseating mass of conglomerated facts and misunderstood misinformation. Thousands of dollars are wasted annually by individuals and corporations who employ more or less conscientious students and readers to rake over the muck-piles and pan out a few facts of real practical value.

Profane language is out of place in respectable technical magazines; but, to speak bluntly, it is high time for some of the damned nonsense in the archives of technical literature to be classified and labeled in such a way that it will die and *stay dead.* Dreamland is a beautiful place for a vacation, but beans and bacon are more nourishing than warm zephyrs.

WILLIAM B. MCKINLAY.

New York, June 12, 1915.

Recent Progress in Flotation

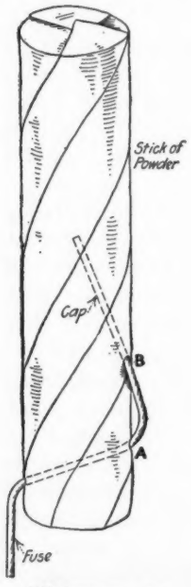
In the JOURNAL of May 29, 1915, recent progress of flotation was discussed by O. C. Ralston and F. Cameron. After an interesting review of various subjects pertaining to flotation methods, the flotation of nonsulphide minerals was discussed. The writer has obtained a basic patent on the sulphidizing of nonsulphide mineral for purposes of flotation in 1905, and has since then done extensive work in this line, some of which is of recent date and has not been published. Messrs. Ralston and Cameron make a number of statements in their article which might unintentionally create the impression that only low-grade concentrates can be obtained by this process. Copper concentrates assaying 23.40%, 24.60% and 43.40% in copper, which I have made, can hardly be called low grade. Nor should lead concentrates assaying from 53% to 71.50%, obtained from lead-carbonate ores, be classed as low grade. In the latter case extractions of 76% can be made commercially without difficulty. Zinc concentrates obtained from carbonate and oxide ores, some of them carrying some sulphide, assaying 52% to 57%, can also be classed as good smelting products, and commercial extractions of 80% and better are obtainable when the proper methods are employed. It might be well in publishing definite conclusions to state under what conditions such tests were made. The flotation of nonsulphides is a field even more difficult than the flotation of sulphides, and surely those who have not made exhaustive tests on the subject might obtain poor results, while when the proper conditions are provided excellent results may be obtained both in the way of getting high-grade concentrates and good extraction. It is here pointed out in the previously mentioned article that a great deal of gangue, especially iron, is carried up. This also is quite contrary to my experience. The H_2S process lends itself particularly well to selective flotation—more so than any other method I have known, and I have separated complex ores with great success. The application of the H_2S process is particularly important for the flotation of those sulphide ores which either carry a percentage of carbonates and oxides or else do not lend themselves well to flotation. This is invariably due to the fact that the sulphides are slightly coated with nonsulphides. Metallic copper and native silver are susceptible to this treatment, and the writer begs to differ with Messrs. Ralston and Cameron in their estimation that the present outlook limits the application of the H_2S process to copper ores. It rather seems that the injection of H_2S gas, which is inexpensive and can be made from waste products which are usually on hand, and the fact that this process can be used in connection with any suitable method of flotation, should secure for it almost universal application.

A. SCHWARZ.

Joplin, Mo., June 2, 1915.

Making Primers

To keep the fuse from pulling out of the powder when making primers, I find a good practice to be as follows: Punch a hole through the powder at *A* and another almost through at *B*. Then push the fuse and cap through *A* into *B* and pull the fuse tight. The cap will not come out then unless the powder comes with it.



METHOD OF PRIMER MAKING

JOS. P. RUTH, JR.

Idaho Springs, Colo., May 25, 1915.

Working During High- and Low-Price Conditions

Just as one of the suggestions the outsider can always give: Why do not mining companies of ample resources work their highest-grade deposits when prices are high and the low-grade when prices are low? This would enable them to make the maximum output of metal when prices were up, and a maximum tonnage over which to distribute overhead costs and other luxuries, with a minimum of metal to disturb the market, when prices are down. During the low-price period development work would be carried on to leave big bunches of high-grade where it would be easy to get at. The above is not supposed to apply to gold ores.

A. A. NASON.

June 7, 1914.

NEW PUBLICATIONS

THE BASINS OF NELSON AND CHURCHILL RIVERS. By William McInnes. Pp. 149, illus. Memoir No. 30, Canadian Geological Survey, Ottawa, Canada.

JOPLIN NEWS HERALD'S 1915 ZINC AND LEAD HANDBOOK. By L. L. Wittich. 3¾x8½, pp. 59, illus., paper; 25c. Joplin News Herald, Joplin, Mo.

LEAD POISONING IN THE MANUFACTURE OF STORAGE BATTERIES. By Alice Hamilton. Pp. 38, illus. U. S. Bureau of Labor Statistics, Washington, D. C.

GEOLOGY OF FRANKLIN MINING CAMP, BRITISH COLUMBIA. By Charles W. Drysdale. Pp. 252, illus. Memoir No. 56, Canadian Geological Survey, Ottawa, Canada.

ORGANIZATION OF WORKSHOPS AND FACTORIES. By Robert Grimshaw. 3½x5¼, pp. 104, paper; 50c. Published by the author, 1330 St. Nicholas Ave., New York, N. Y.

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE YEAR 1913. By John McLeish. Pp. 363, illus. Canadian Department of Mines, Ottawa, Canada.

A PRIMER ON EXPLOSIVES FOR METAL MINERS AND QUARRYMEN. By Charles E. Munroe and Clarence Hall. Pp. 125, illus. Bull. 80, U. S. Bureau of Mines, Washington, D. C.

THE CONDENSATION OF GASOLINE FROM NATURAL GAS. By George A. Burrell, Frank M. Seibert and G. G. Oberfell. Pp. 106, illus. Bull. 88, U. S. Bureau of Mines, Washington, D. C.

SOME MINING DISTRICTS IN NORTHEASTERN CALIFORNIA AND NORTHWESTERN NEVADA. By James M. Hill. Pp. 200, illus. Bull. 594, U. S. Geological Survey, Washington, D. C.

MAPS OF THE MINING DISTRICTS OF MINNESOTA, 1915. Compiled by E. H. Comstock. 12x17¼, 13 sheets; $1. Minnesota School of Mines, Experiment Station, Minneapolis, Minn.

SUMMARY REPORT OF THE MINES BRANCH OF THE DEPARTMENT OF MINES FOR THE YEAR ENDING DEC. 31, 1913. Pp. 214, illus.; 15c. Canadian Department of Mines, Ottawa, Canada.

ANNUAL STATISTICAL REPORT OF THE AMERICAN IRON AND STEEL INSTITUTE FOR 1913. 6x9; pp. 152; paper. Bureau of Statistics, American Iron and Steel Institute, Philadelphia, Penn.

NOTIZIE SULL'INDUSTRIA MINERARIA NELLA VENEZIA SOTTO IL DOMINIO DELLA REPUBLICA. E. Oreglia. Appendice alla "Rivista del servizio minerario nel 1913." 7¼x10¼, pp. 82, illus., paper. Ministero di Agricoltura Industria e Commercio, Rome, Italy.

ANNUAIRE POUR L'AN 1915, PUBLIE PAR LE BUREAU DES LONGITUDES. 4x6, pp. 1075, illus., paper; 1.50 fr. Gauthier-Villars et Cie, Paris, France.

In addition to the customary astronomical tables this contains a number of mathematical tables, and conversion tables of weights and measures.

STAMP MILLING AND CYANIDING. By Francis Andrew Thomson. 6x9, pp. 285, illus.; $3. McGraw-Hill Book Co., Inc., New York, N. Y.

In spite of the number of books already offered in the field of milling and cyaniding, both as textbooks for students and reference books for operating engineers, this one is not superfluous. Usually stamp milling and cyaniding are treated in separate volumes, but Prof. Thomson prefers to take them together. This is perfectly natural, since all ore that is cyanided must first be milled in some way. The author does not confine his section on stamp milling to the actual operation of stamps, but includes ore crushing by other methods, such as chilean mills, rolls and similar machinery. The book is particularly applicable to the uses of students, for which purpose its value is enhanced by a complete bibliography attached to each chapter. Professional men should also find this of interest and value, since it may lead to the discovery of unknown data. Of course, articles on pertinent subjects are continually appearing in the technical press, and no book can presume to be up to the minute with references to them, but Prof. Thomson has certainly succeeded in selecting the most important of those articles and books which have appeared in recent times.

The Gold Hill Consolidated

One year ago this week (June 15) the New York *Sun* treated the public to the edifying reproduction of a letter on Senate stationery, signed by a pseudo-mining-geologist, giving his opinion that a valuation of $60,000,000 for the Gold Hill property was a conservative figure.

The JOURNAL dealt with this at length in its issue of June 20, 1914, and editorially suggested a method whereby any uncertainty as to the value of the Gold Hill property could very quickly be relieved.

A news dispatch from North Carolina now announces the appointment by the court of receivers for the Gold Hill property, which has been shut down and idle for several months, and adds that Walter George Newman, of New York, the president of the company, who defended his use of United States Senate letter paper in a publicity campaign booming the property, is not at the mine and there is no one in his absence to tell of the company's assets and liabilities.

It did not require a periscope of perspicacity to foresee this dénouement.

Rich Ore at the Temiskaming Mine

In the accompanying photograph is shown a rich slab of ore from the 530-ft. level of the Temiskaming mine, at Cobalt, Ont. This slab is almost wholly metallic. It is 7 in. wide—the width of the vein—5 ft. 7 in. high and

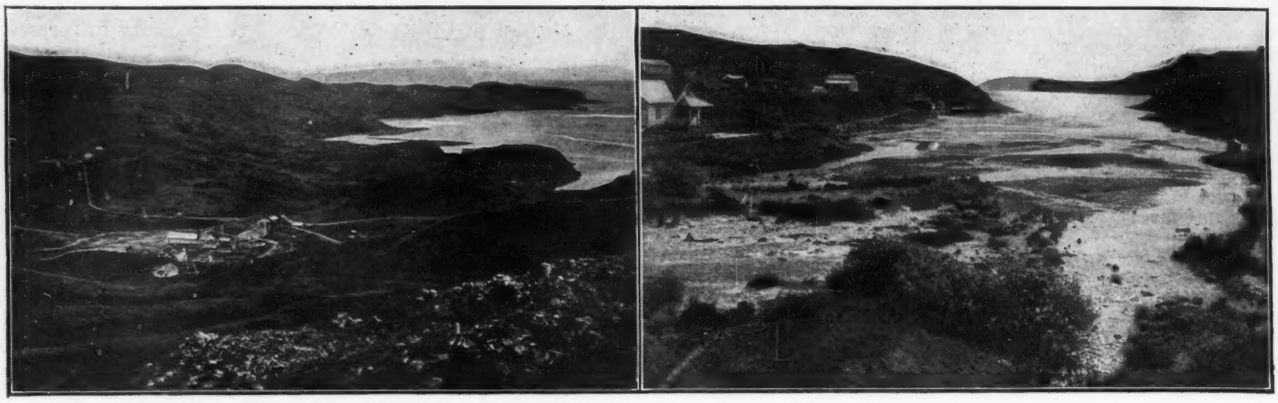
RICH ORE AT THE TEMISKAMING MINE

weighs about 600 lb. Its approximate assay is 10,000 oz. silver per ton. Its value as a specimen is increased through its large content of ruby silver. The specimen has nearly the shape of a bass viol, and is not far from the average size of such instruments.

Spanish Prohibition of Metal Exports

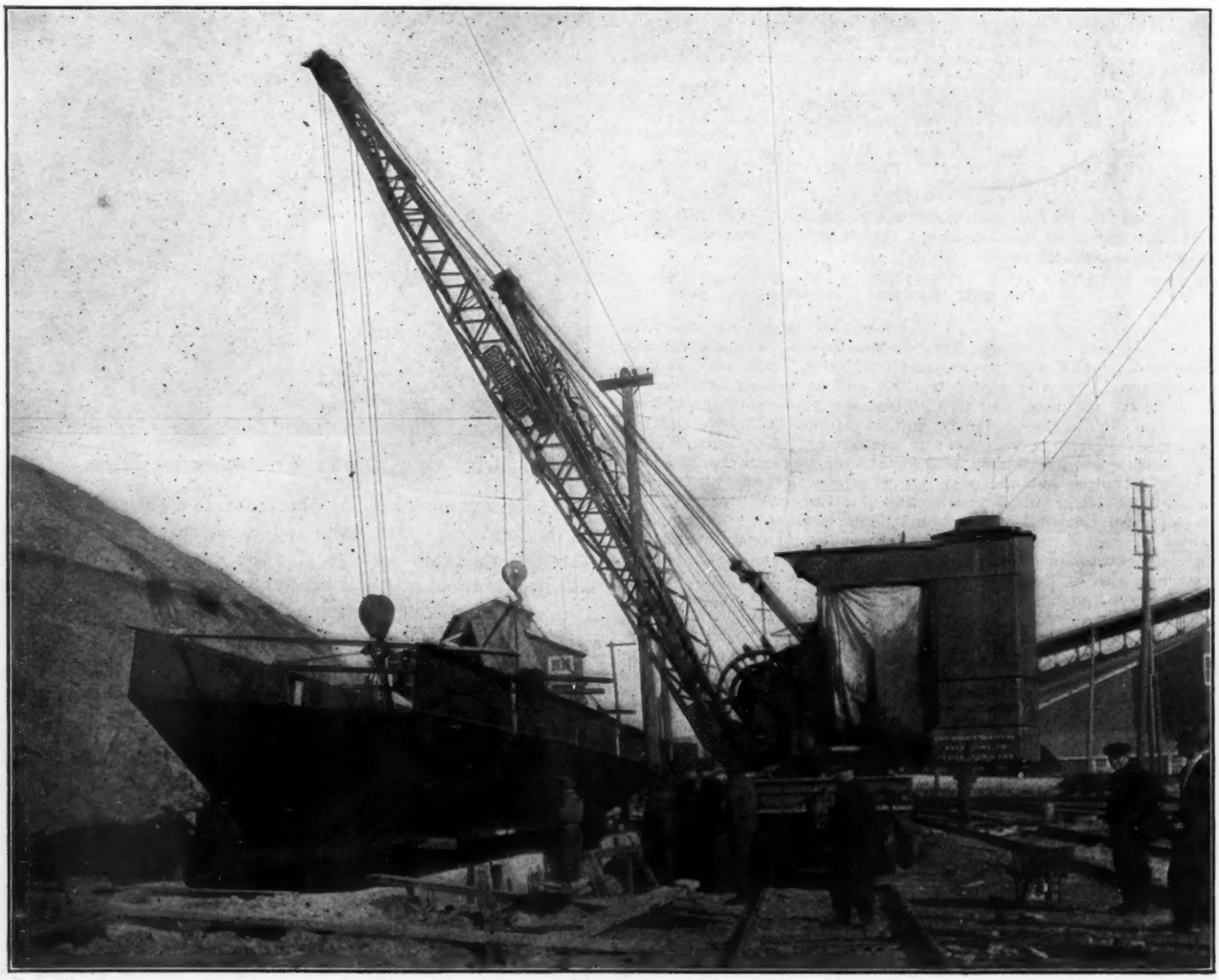
The exportation from Spain of the following articles has been officially prohibited, according to the *Iron and Coal Trades Review*: Aluminum and alloys thereof; antimony and alloys thereof; bauxite or aluminum ore; tin and alloys thereof; zinc and alloys thereof in cakes; nickel and alloys thereof; rubber and mixtures thereof; anhydrous or hydrated alumina; chrome; molybdenum; manganese (metal); vanadium; ferrochrome; ferromolybdenum; ferronickel; ferrotungsten; ferrovanadium; partly or wholly manufactured articles of copper or brass; tinplates.

Photographs from the Field



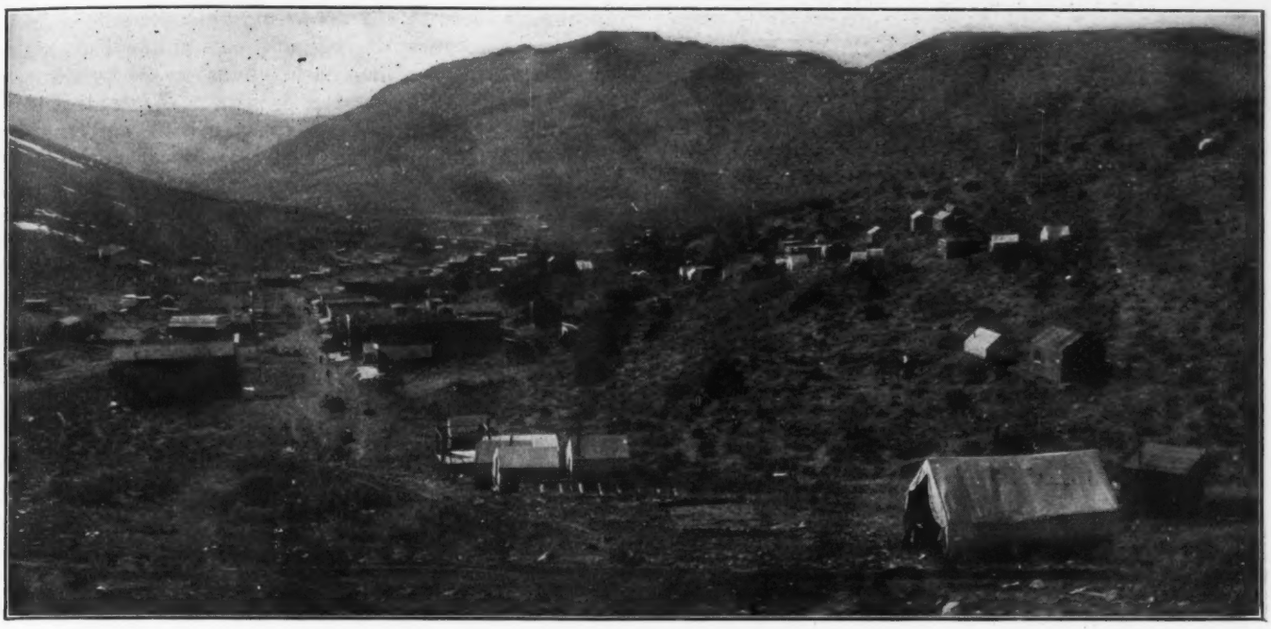
DELAROF DEVELOPMENT CO.'S CYANIDE PLANT, UNGA ISLAND, ALASKA

Treating tailings from 500,000 tons of ore crushed during the 25 years of operation of the Apollo mill. The cyanide plant is a 200-ton leaching installation



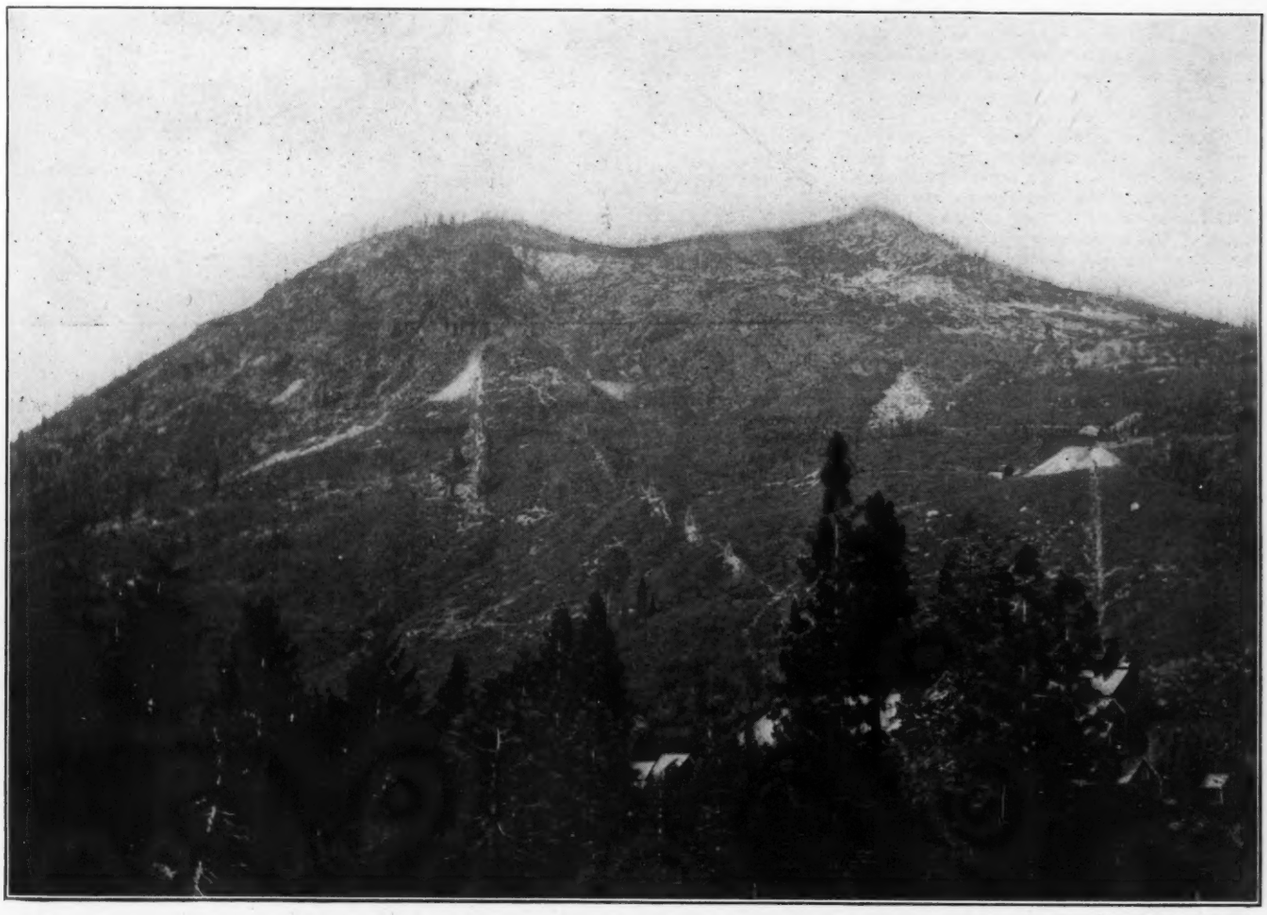
UPTODATE CONSTRUCTION METHODS AT THE ANACONDA PLANT, MONTANA

Setting up the leaching-plant dewatering tanks with a locomotive crane. This set of tanks is 101 ft. long



ROCHESTER, NEV.

A view of the new camp that is making a good reputation and living up to expectations



EUREKA MOUNTAIN, JOHNSVILLE, PLUMAS COUNTY, CALIF.

This hill is one of California's best producers; $40,000,000 is claimed to have been taken from it

Mr. Ryan on Copper

John D. Ryan, president of the Anaconda Copper Mining Co., who has for several years been arguing vigorously for legislation permitting American manufacturers and sellers of commodities to combine in their selling organizations abroad for the purpose of mutual protection, recently gave the new Federal Trade Commission some very important information on the conduct of the copper export business and created a very favorable impression, it is said. As reported by the *Boston News Bureau,* Mr. Ryan made the following statements and arguments:

"If, during the 10 years ended with 1913, the American copper producers had been permitted to sell their export metal through one organization and thereby meet the combined forces of European buyers, we would have received $60,000,000 more for our copper which went abroad in that period. This would have been an average of $6,000,000 a year."

Figures were presented by Mr. Ryan showing that three producers of this country, controlling 50% of the output, had in the 10 years' period in question sold 5,560,000,000 lb. of copper for which $821,000,000 was realized. Of the total 2,580,000,000 lb. was sold to home users at an average price of 15.21c. per lb. delivered at New York or Connecticut points, whereas the 2,980,000,000 lb. sold abroad brought an average price of but 14.38c. per lb. delivered at European ports. In these cases the producers paid the freight abroad.

He then went on to tell of the manipulation conducted by foreigners through the medium of the London Metal Exchange when they desired to buy our copper cheap. After hammering down the quotations on the London Exchange, he said, the market here was affected and the European buyers were able to get their copper at low figures. This was done, he added, through a combination of buyers. Not until after the cheap copper had gone to the foreigners did the American consumers have a chance to get into the market and they were as a result forced to pay higher prices.

"If the producers were permitted to combine in selling to foreign purchasers there would be no more cut-throat competition among the Americans to secure export business. All of us would get a share of the business at better prices and the American manufacturer would be able to get his copper at a price surely as low as that commanded abroad," continued Mr. Ryan in elaborating on his theory.

"In the 10 years' period which I have mentioned the domestic consumers were forced to pay about ⅞c. per lb. more for their copper than the Europeans, and this condition should not prevail," he added. "If necessary legislation were put through Congress and this commission given power of control it would be the best thing that could happen for all of us interested in exportation of products."

Mr. Ryan laid great stress on the fact that natural products of this country were being practically given away because the American manufacturers and producers were forced to compete against each other in striving for foreign business.

Recovering Potassium from Flue Dust

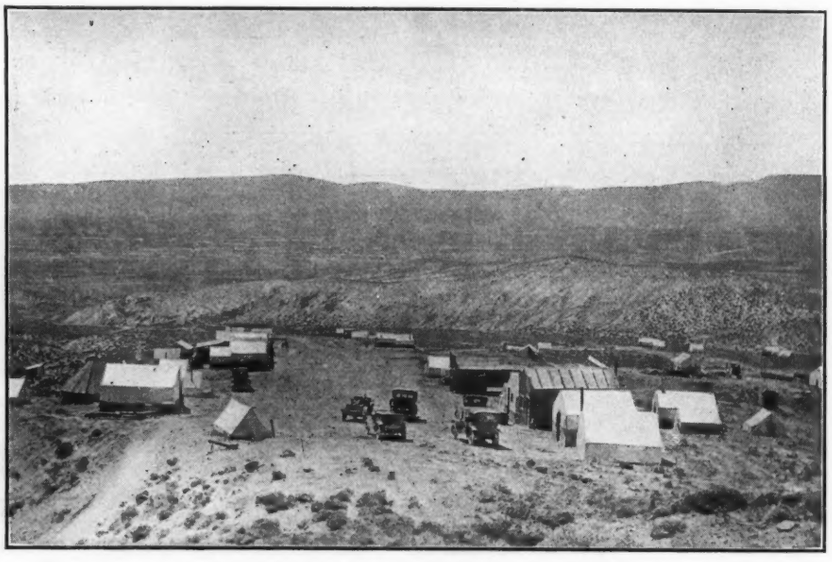
A process for the recovery of potassium from flue dust is proposed by Samuel Peacock (U. S. pat. 1,124,798).

The flue dust resulting from portland-cement manufacture, as well as from other sources, includes valuable potassium salts, since in the ordinary processes of roasting and drying as much as 50 to 75% of the potassium contained in the charge is volatilized and passes out with the flue dust. It is generally known that the total potassium in this dust, from 40 to 60%, is usually combined as a basic silicate, and is insoluble in water. According to the Peacock process, the flue dust is first treated with water to extract any water-soluble potassium oxide, and in order to recover the potassium from its silicate combination a solution of ordinary acid sulphate in water which contains phosphoric acid, chiefly in the form known as monocalcium phosphate, is used. When the basic potash salts or silicates are finely ground and digested with a hot solution of the monocalcium phosphate, a reaction occurs which yields potassium phosphate and calcium silicate. When the calcium silicate which contains the potassium salt is finely ground and digested with acids, such as sulphuric acid, the potassium is recovered in the form of a soluble salt of the acid used. Accordingly, the flue dust may be treated with a suitable acid and the potassium held in the calcium silicate may be recovered.

The New Camp of Willard, Nev.

SPECIAL CORRESPONDENCE

The camp of Willard, Nev., christened for the champion over Jack Johnson, seems to be making good. The first free gold was found by knocking off a piece of slate from a ledge which stands 20 ft. high in a gulch. The discoverer, J. H. Downey, a mining man from Idaho, then came to Lovelock and took an option on the claim on which he had found the gold for $2000, and secured the help of Mr. Ward, a placer miner from Alaska, and Mr. Benedetti, a moving picture man. Five hundred dollars was then paid on the claim. They started to work; the news spread and a substantial camp has resulted.



THE NEW CAMP OF WILLARD, NEV.

Willard has now several hundred people in its vicinity. It is nine miles northeast of Lovelock, but only four miles from Kodak, a siding on the Southern Pacific R.R., where the ore is now shipped. The Humboldt River runs close to the railroad, and there is also a spring about half a mile from the main camp.

A telephone line is in operation. The Nevada Valleys Power Co. has made surveys and is arranging to establish a transformer station on its line which passes within two miles of the camp on its way to Rochester, Nev.

High-grade rock has been found on six different claims, while pannings can be secured on as many more. The district is about two miles east and west by a half mile north

and south, but the veins strike northwest-southeast and dip west. The hill where the first strike was made is slate with the values in the silicified bedding planes; but there are volcanic intrusives on the claims to the east, where some of the high-grade has been found.

It is too early to give any definite idea of the geological structure. Suffice it to say that there are andesites, porphyries, schists, rhyolites and basalt, as well as slates. Galena, sphalerite, copper stains and garnets are found in the quartz.

There are 18 sets of leasers now at work, six of whom are sacking ore. The Oddie lease, on the claim of the original strike, has let a contract for a shaft which is going down with two shifts daily. Anything over $20 per ton can be shipped at a profit, as the wagon haul to the railroad is only $2, and smelting and freight, $6.50, sliding upward according to value.

The past 30 days has seen the usual disputes and adjustment of differences on claim boundaries and ownership interests.

Several deals are pending and companies are beginning to be formed. A mill is already being figured on, as several good-sized bodies of low-grade, free-milling ore have been cut by short tunnels on leaser's ground. A townsite was formed, but has had little success, as of course it cannot give satisfactory title; besides, people are not spending their money for lots.

With the amount of work now going on, the next 60 days should determine the extent and nature of the orebodies, and give those who "come right in and turn around and go right out again" a better chance to pass judgment, as all new camps must go through the hot fires of the critics' analyses until they get on a permanent producing basis.

WILLARD—A VIEW FROM THE WEST

SACKING AND LOADING THE FIRST SHIPMENT

Celebration of the Fiftieth Anniversary of the Worcester Polytechnic Institute

The founding of the Worcester Polytechnic Institute in 1865, the first technical school to have a regularly equipped manufacturing establishment to supplement the course in mechanical engineering, was appropriately celebrated June 8, 9 and 10 at Worcester, Mass. Delegates from nearly 90 colleges, universities and technical schools were present, as were also delegates from eight engineering societies. The American Society of Mechanical Engineers was represented by its president, John A. Brashear, and its secretary, Calvin W. Rice.

It had been expected that Maj.-Gen. G. W. Goethals, U. S. A., would be one of the principal speakers, but owing to his being summoned to testify in the United States Court at Indianapolis, his presence was impossible. Much of the disappointment of the audience, however, was allayed by the splendid address of Mr. Brashear, who spoke directly to the graduating class and student body of his many years of experience, interspersing many amusing anecdotes and giving a personal and intimate touch to his remarks, because of his long friendship and association with Dr. T. C. Mendenhall, former president of the Institute, and Dr. Ira N. Hollis, its present head.

Mineral Production of South Australia

The official report for 1914 gives the production of metals and minerals in South Australia for the year as follows, the figures in parentheses giving the corresponding production for 1913: Gold, 6258 oz. (6556 oz. in 1913); silver, 3006 oz. (2650 oz.); silver-lead ore, 18 tons (153 tons); copper, 6881 tons (7161 tons); iron-ore flux, 42,622 tons (60,658 tons); limestone flux, 54,054 tons (44,300 tons); phosphate rock, 6083 tons (5950 tons); crude salt, 65,000 tons (65,000 tons).

In addition to the outputs given above there was a production of miscellaneous minerals valued at $179,425. The chief items of this production were gypsum, kaolin and radium-producing minerals. This brought the total value up to $2,881,704 for the year.

The number of mining claims and leases held at the close of the year was 1039, covering 57,089 acres; of search or prospecting licenses, 286, covering 748,800 acres. The number of men employed at the end of the year was 5755, of whom 3000 were working in the copper mines and 1650 in connection with the smelting works at Port Pirie. The total number of accidents reported in mines and quarries was six, in which four persons were killed and two injured.

Editorials

Developments in the Spelter Situation

About two weeks ago spelter touched its high point. Since then the market has been recessional. Although all conditions are abnormal, developments are occurring in a perfectly normal way. The upward pushes in the market were given by the ammunition manufacturers. When they ceased buying there was nothing to hold it up, peaceful manufacturers having been put out of business. In the meanwhile production is increasing, and is likely to increase further, for smelters are doing the obvious thing in the direction of increasing capacity.

It has of course been recognized that the present situation in spelter is ephemeral, that it is not to be expected to continue after the termination of the war. The uncertainty about the latter is what prevents the erection of new smelteries. A new plant in the Kansas-Oklahoma gas fields might be built in about eight months. A plant for the Eastern coal fields would require 12 to 18 months. It is unnecessary for us to elaborate upon the dubious conditions that would attend the inauguration of new smelting enterprises. In this juncture the obvious thing, of course, was for existing smelters to add more furnaces to their plants, which could be done in relatively short time and at moderate cost. We understand that this is being done already in several cases.

In the meanwhile domestic consumption is being contracted in an unmistakable way. It is idle to say that a little difference in the cost of the raw material does not trouble the ultimate consumer. Some one needs a new sheet of zinc to put under his kitchen stove. A square 5x5 ft. of No. 21 gage—0.08 in. thick—weighs 75 lb. In ordinary times this would cost him about $6. Now it costs him about $30. Nobody would pay such a sum for such a purpose. He would either make the old sheet do a while longer or would put down a piece of sheet iron. This illustration is not imaginative. It summarizes an occurrence. So it is that the ordinary consumption of zinc in the form of sheet for galvanizing and for brass-making is being annihilated. We are in receipt of numerous inquiries for ways out of the predicament. One galvanizer asks us about erecting a smelting plant on his own account. Another inquires for an expert who can teach him how to make terne plate as a substitute for galvanized. A plumber figuring on a household job advises the use of sheet iron instead of sheet zinc. Galvanizers are drawing their pots and offering spelter for resale. This exemplifies the state of the natural market that has been disrupted for the sake of ammunition manufacturing.

What are the prospects for the next six months? The two great factors are the state of the sales books of the producers and the state of the order books of the ammunition manufacturers. Of considerable importance also is the position of speculators who intervened to scalp a profit on the rise. Of course none of these factors can be gaged any more than approximately. It has been the common assumption that the ammunition buying was endless. Nothing could be more erroneous. The brass-making capacity of America, if nothing else, imposes a limit. Assuming the brass-making capacity to be 450,000 tons at the outside, the spelter requirement would be 150,000 tons at the maximum. It is doubtful if in any year previous to 1915 any more than 75,000 tons of spelter was ever used for brass-making. It is probable that the ammunition-makers to a large extent contracted at one time for all the spelter they were going to need. Certain of them did so, having thus informed us. When buying was conducted in that way it was but natural that the price for the metal should be elevated to an extravagant figure.

As for the smelters, they have probably contracted to deliver about 50% of their expected production in the second half of 1915, which will probably be about 250,000 tons. They have therefore a large surplus still to sell, which will be increased by the production of new furnaces, while the supply also will be swelled by the unloading of speculative accounts and by consumers' resales.

The nervousness that has been exhibited since the cessation of the crazy buying for ammunition has been indicative. The ammunition demand has probably not yet exhausted itself, but it is likely to be executed more judiciously than heretofore. Previous to the war the world's annual production of spelter and copper was about 1,000,000 metric tons of each, and the consumption was approximately the same. It is incredible that the Allies are going to buy in six months 250,000 tons of spelter for military use, and 500,000 tons of copper to go with it. But if they are not going to buy it the price must manifestly come down to a point where galvanizers may resume the use of the metal.

Sooner or later this is what is going to happen to spelter. The decline that has already begun may or may not be the beginning of the big decline. A decline in our market below the London parity may renew an exportation from here and check temporarily a further decline. But whatever the market fluctuations may be, recessions or rallies, it is self-evident that unless the military are going to consume all, or nearly all, of the world's production of spelter the price must fall to a point permitting resumption of its use in the ordinary channels of trade.

The Rise in Lead

The further rise in the price for lead, which proceeded with a violence that exceeded that of the rise in spelter in its early stage, is better explained by madness on the part of the buyers than by anything else. In this metal there was never any such stress in the statistical position as in the case of spelter. Even before the war the overproduction by the mines was creating a desperate situation, and in spite of the curtailment enforced during the fall, in order to avert disaster, the mines of the United States reported a staggering production for the year. It

is incredible that normal consumption in the United States in the first half of 1915 has increased so as materially to alter the conditions of natural absorption. In the meanwhile Great Britain has been regaining its normal supplies from Spain and Australia, while as for the Mexican supply, that is just about what is was last year, i.e., insignificant. In short, we do not see how there can be any dearth of lead supply, either present or prospective.

Rather does it seem to us that the sudden and extravagant rise in the price for lead is ascribable to the same kind of ill-advised buying that was responsible for the spectacular rise in spelter. Perhaps it was due in part to the effect of the latter upon the imagination of buyers. The burned child dreads the fire, and having been burned in the spelter market everybody thought to escape a similar happening in lead, and the same idea occurring to everybody at the same time the precise condition was brought about that it was aimed to avoid. A lot of buyers cannot contract within two or three weeks for all the lead they are going to require in six months without creating a crazy market. It is something like that which we have lately witnessed, and among the strange things incident thereto we have seen the American Smelting & Refining Co. supplying its regular customers at less than their competitors, and certain of the independents holding aloof to catch the crest of the wave before selling.

We cannot conceive how there can be any shortage of lead in the United States, for not only is there plenty of lead ore, but also there is a great surplus of lead smelting capacity over what was used in making the phenomenal production of the first half of 1914. While the high price lasts, however, it will be a boon to the mining industry that will be more generally distributed among the small mines of the Rocky Mountains than the high prices for copper and zinc, and without doubt their operators will make hay while the sun shines.

Human Nature Does Not Change

When the economic history of the metal markets in 1915 is written—say 10 years hence—with the perspective of a distant review many events that are now accepted as matters of course will stand out as things grotesque. No one of these will appear more fantastic than the events in the zinc industry unless they be surpassed by the wild movement now going on in lead. In zinc we have witnessed a rise in value of upward of 500% within a half-year. We have seen zinc mining and smelting companies that one year ago were hopeless derelicts, with neither money nor credit, surpassing the stories of Aladdin and Monte Cristo and talking now about earning this year a sum equal to their entire capital stock. We have beheld a crazy speculation in their shares and doings extraordinary in the spelter market. Yet most of these favorites of fortune are unhappy. Aladdin and Monte Cristo were satisfied. The possessors of zinc interests are not. Right down the line, from the capitalists who have reaped the greatest profits to the workmen who have gained the least, there is dissatisfaction, discontent, and a demand for more. With spelter at 25c. it was regarded as a matter of right that it ought to be 30c. A tendency of the market to recede was considered as something akin to criminal. The cupidity of human nature had one of its most startling exhibitions. For the benefit of the future historian let us state—in a fragmentary way—some of the things that have happened and are happening.

The rise in zinc in its early stages so stimulated the production of zinc ore that the smelters did not have capacity enough for all that was offered. Where they had sliding-scale contracts they were obliged to live up to them, but if there were any provision for a minimum to be taken they exercised it. Producers who had no contracts found themselves unable to sell ore at all. Result, unhappy miners.

The Joplin producers have a theory that the price for ore in their district ought to be eight times the value of 100 lb. of spelter, but when spelter was around 10 to 12c. the price for ore was only about $55@60 and not until spelter went above 20c. did ore go to $100. This led to a demand upon the Department of Justice to see if the smelters had not combined to skin the producers, who were very unhappy. At the same time the consumers of spelter, unhappy over the high price for spelter, requested the Department of Justice to investigate if they also were not being skinned.

When ore rose to $100 in the Joplin district there was a better feeling there, the occasion being celebrated with the aid of a brass band; but it turned out that there was a fly in the ointment. The miners naturally wanted more pay. When an increase was given them they did not want to work more than five days in a week, stating that they could earn enough money in that time—which was perhaps good philosophy, but was adverse to the maintenance of production.

The smelters have been making a lot of money, but they too have complaints. In the early part of the year they complained that they had to take in ore under contracts and could not sell spelter ahead against it as freely as they ought to. Later when that condition changed the burden of their complaint was that they were having to take in ore on the basis of 25c. spelter while they were delivering spelter on their old contracts at 8@10c. per lb.; that while they would realize on their high sales in the third and fourth quarters, that was a long time to wait; and what if some buyers should fail to make good on their contracts? Hence some unhappiness on the part of the smelters.

Among the buyers of spelter the purchasing agents for the ammunition manufacturers finally became alarmed, their prospective profits being seriously threatened. As for the galvanizers and manufacturers of brass for peaceful purposes, they had to watch their business becoming paralyzed. The calamity fell upon the ultimate consumer and from him was reflected upon the manufacturer, from whom it will be reflected upon the smelter.

The unhappiness of the manufacturers and consumers is of a different sort than that of the producers. The consumers find themselves unable to enjoy conveniences that formerly they used to. The manufacturers see their business being ruined. The producers are unhappy for not making money enough!

Human nature remains unchanged. Riches have always bred discontent and always will. When spelter was at 5c. per lb. and everybody was working hard in order to make both ends meet everybody was happy. We fancy the lead producers will be the next to become unhappy. The copper producers appear so far to be the only contented ones, but copper is not yet 50% above normal, while spelter has been to 500% and lead to nearly 200%.

The Tonopah Belmont Report

We had occasion not long ago to call attention to the extraordinary completeness of the report of the Goldfield Consolidated Co. That report was valuable to those who study mill operation from the financial standpoint, as well as to the practical technologist. It is a pleasure to call attention at this time to another report that is quite as complete and satisfactory from both points of view. This is the statement of the Tonopah Belmont Co. for 1914. The company always has been prolific in the distribution of its data, but this report contains several items which are particularly interesting to the profession. Not the least among them is the account of the change, at the Millers plant, to treatment by the continuous counter-current decantation system, in which the costs of both processes are set forth. This is the kind of information that really counts, and the kind we hope to meet with increasing frequency. Such reports are creditable to the company that makes them and a tribute to the intelligence of those interested in mining, whether as an investment or as a profession.

⁂

We understand that metallurgical operations at Chuquicamata have been begun with far less hitch than was expected by the designers of the plant, who naturally had in view the probability of infantile disorders. A 10,000-ton charge has been leached in one of the mammoth tanks without development of any of the irregularities which skeptics predicted. In fact the extraction is reported to have been higher than 90% of the copper in the ore. Copper is now being precipitated in the electrolytic department, but none of the cathodes has yet been melted. Congratulations are extended to the Chuquicamata staff for their success so far, with a renewal of the assurance that everyone hopes that their originality and boldness will result in one of the great metallurgical triumphs of the age.

⁂

The premier among the war stocks is easily Federal Mining & Smelting, which last week rose from $18 to $60 per share. Early in the year it sold for $8. More than half of the common stock of this company is in the treasury of the American Smelting & Refining Co., which bought it years ago when it used to sell above par. Since then it was written down on the books of the smelting company as an investment greatly shrunken in value. The high price for lead will be a boon to this company, but the behavior of the stock, along with United States Reduction & Refining Co., Quicksilver, Comstock Tunnel and others of that ilk, savors of a reckless speculation that takes no account of value.

⁂

The curb market which for a long time has had but a short list of good mining stocks has lately gained a considerable number of respectable issues. Among these are: Alaska Juneau; American Zinc, Lead & Smelting; Chile Copper Co.; Howe Sound (Britannia); Kennecott Mines, and St. Joseph Lead Co. All of these are big companies, most of them producers which heretofore have been closely held. The street is an exercising ground where they are exhibited to the public. If they are received favorably and a distribution of their shares is effected such stocks in the course of time are usually transferred to the Exchange.

The zinc stocks had a spectacular rise. During the last fortnight the lead stocks soared in a similar way, but even more rapidly. Some of the copper stocks have scored good advances since the beginning of the year, but none of them has discounted the rise in the metal. The porphyries are selling at about where they ought to if copper were at 14½c. Amalgamated and Anaconda are actually lower than they were in the early part of 1914.

⁂

We judge from the press dispatches that the idea is obtaining recognition in Mexico that recent events in Washington have extinguished the policy of "watchful waiting"; wherefore it will be wise to consider means to end the lawlessness that has for several years prevailed south of the Rio Grande.

BY THE WAY

At Wallace, Idaho, they are training the young lads to be miners. As an added attraction for their Fourth of July celebration they have arranged for a team of 11-year-old drillers. A team entered from Sumpter, Ore., has a record of 21¼ inches drilled in hard granite in 15 minutes.

⁂

An engineer at Salt Lake City writes that one of the smelters in the Salt Lake Valley came near getting "stung" lately by a shipment of "duplex cable" which was billed by the junkman as copper wire. On transmission lines in the West a considerable amount of duplex cable-wire having an iron or steel center and copper surface is used on long spans where great strength is desired. Some of this cable eventually finds its way, via the junkman, to the smelters. However, in the instance cited, the real character of the cable was discovered before payment was made. It may be added that several copper works in the East have at times paid for copper when they received a large proportion of steel. One of the difficulties in detecting the duplex cable is that in shearing small wire there is a tendency for the soft copper to be drawn over the steel center, thus obscuring the real character of the wire.

⁂

The following picturesque and beneficent result of the rising price of zinc is from the New York *Times*:

A wealthy mine operator of Joplin and Indianapolis owes his life to the high price of zinc. Held prisoner in an abandoned zinc mine, he had been left to perish, and doubtless would have done so had not two prospectors gone into the old diggings and discovered him after he had been in the drift five days. He was unconscious, but was soon revived. The high price of ore caused the prospectors to enter the drift in the hope of finding zinc overlooked by former operators.

The operator says he was accosted at a Joplin hotel by strangers who said they were desirous of looking at mining land. He does not remember the names of the men, but says they drove with him to the abandoned mine. In a remote drift, he says, he was bound, gagged, and tied to a piece of mine timber. The kidnapers attached a long fuse to a box containing dynamite. The fuse was lighted, and one man said:

"This will reach the dynamite in 12 hr., and if the rats don't get you first, this will finish the job."

The rescuers discovered that the men in walking about had accidentally cut the fuse.

[If the proposition wasn't any better than some we have been dragged out to look at, we can appreciate the frame of mind of the alleged "kidnaper."—EDITOR.]

PERSONALS

Arthur J. Hoskin, Denver, is at Tin Cup, Colo., examining placer property.

R. M. Henderson, manager of the Wellington Mines Co., Breckenridge, Colo., has been in Denver.

Geo. Watkin Evans, of Seattle, Wash., recently visited New York City on professional business.

Philip Argall, returning from London, spent a few days in New York and then proceeded to Denver.

Willard S. Morse is in charge of the new tin-smelting plants of the American Smelting & Refining Co.

William Braden left for Chile last Saturday. He is engaged in exploring a promising new copper deposit there.

Pope Yeatman is expected home from Chile in July. E. A. Cappelen Smith will probably remain at Chuquicamata until the fall.

Frederick P. Burrall has gone to the Klondike district on professional work. He will return to New York about the middle of October.

D. B. Dowling of the Canadian Geological Survey is in charge of investigations into the coal and oil resources of Alberta and Saskatchewan.

Geo. H. Garrey, who has been on examination work in British Columbia, Nevada and California for the last eight months, has returned to New York.

Karl Eilers is about to leave on a long tour of inspection of the western plants of the American Smelting & Refining Co., returning to New York in October.

W. E. Hartman, Chicago, has been retained by the Youngstown Sheet & Tube Co. as consulting engineer on the construction of 204 coke ovens at Youngstown.

Stewart M. Marshall has resigned as chief engineer of the Cambria Steel Co., Johnstown, Penn., to accept a position with the Southwark Foundry & Machine Co., Philadelphia.

Frederick G. Clapp, of Pittsburgh, has recently returned from a year and a half spent in geological explorations in China. His address is as before, 331 Fourth Ave., Pittsburgh.

John W. Finch, one of the best known mining engineers of the West, was operated upon some days ago at St. Joseph's Hospital in Denver for appendicitis. At last reports he was well on the road to recovery.

E. R. Faribault, who has made a special study of the gold-bearing series of Nova Scotia, will continue the geological mapping of this series in Queens and Shelburne counties for the Geological Survey of Canada.

J. W. Mercer is on a summer journey through the West, expecting to visit the gold mining states of the Rocky Mountains and the Pacific Coast, whence he does not intend to return to New York until late in the summer.

Durward Copeland, metallurgist for the Cia. Estañifera de Llallagua, has been in New York and vicinity for several weeks, and will leave soon for a trip to the principal tin-producing centers. He will return to Bolivia in about five months.

M. R. Hull, who, for the past six years has been connected with the engineering department of the Anaconda Copper Mining Co. at Great Falls and Anaconda, Mont., has recently been appointed superintendent of construction at the Washoe Smelter at Anaconda.

C. H. Morse, Sr., now more than 80 years old, has resigned as president of Fairbanks, Morse & Co., after serving in that capacity for 25 years. He is succeeded by his son, C. H. Morse, Jr., but will retain his interest in the company and will act as a director.

J. A. Dresser is this season conducting for the Canadian Geological Survey an investigation of the mineral and other natural resources of the Lake St. John region in Quebec. This will include the Palaeozoic basin surrounding the lake and the deposits of iron ore in the region to the east.

John Nichols, who has had charge of the El Paso mine, Cripple Creek, Colo., and has been operating mines throughout the West for many years, has retired. His place has been filled by the appointment of Joseph J. Darnell, also a practical superintendent of many years' experience not only in the district but throughout the state. It is understood that the company's new directors have inaugurated radical changes in operation and development.

C. L. Miller, vice-president and general superintendent of the American Steel & Iron Co., Pittsburgh, announces the following appointments, effective June 1: B. D. Pheneger, superintendent of Donora furnaces, has been made superintendent of the Central furnaces at Cleveland, Ohio, succeeding Chester A. Orr, who resigned to become manager of the Cleveland Metal Products Co.; Charles J. Brown, formerly superintendent of Shoenberger furnaces in Pittsburgh, has been transferred to Donora, and John C. Hopkins, superintendent of Emma furnace at Cleveland, has been made superintendent of the Shoenberger furnaces.

OBITUARY

Michael J. Toomey, a well known Porcupine prospector, was drowned in the rapids near Keys, Ont., on the Porcupine River, June 9, by the upsetting of a canoe. He took a cramp and sank instantly. He leaves a widow.

Thomas Roach died at Pueblo, Colo., June 5, aged 63 years. He had lived in Pueblo for 33 years and had been connected with the mills of the Colorado Fuel & Iron Co. Under his charge the first rails made in Colorado were rolled.

Frank A. Milne died at Butte, Mont., June 4, aged 50 years. He was born in Lockport, Ill. He went West first a number of years ago, but returned to his eastern home. A few years ago he went to Montana again and settled in Anaconda. In 1913 he went to Butte and became associated with the Davis-Daly Mining Co. as auditor.

SOCIETIES

American Society of Mechanical Engineers—The spring meeting will be held at Buffalo, N. Y., June 22-25. Headquarters will be at the Hotel Statler and the sessions will be held there and at Niagara Falls.

Colorado Scientific Society, at its regular June meeting, was addressed by Prof. Herman Fleck, of the chemistry department at the Colorado School of Mines, on the subject, "The Commercialization of the Chemical Reaction."

McGill University, Montreal—The applied science department has turned over its mechanical equipment for the manufacture of shell tools and every student of this department will devote his time exclusively to this class of work.

American Mining Congress—Official notice has been issued of the 18th annual meeting, which is to be held in the Exposition Memorial Auditorium at San Francisco, Sept. 20-22. The program is a long one, including many important topics for discussion.

Machinery Club of New York—Charles A. Schieren, Charles A. Schieren Co., New York, was elected president at a meeting of the board of governors held June 1. John A. Hill, Hill Publishing Co., was elected vice-president; E. H. Benners, Crown Castings Co., treasurer, and Frederic Stadelman, Wellman-Seaver-Morgan Co., secretary.

International Engineering Congress—A very convenient booklet has been issued by the Committee of Management, International Engineering Congress, 1915, which contains valuable information for members in the Congress and for visitors who intend going to the Pacific Coast at the time of the sessions of this Congress. The booklets can be obtained by mailing a postal to W. A. Cattell, secretary, International Engineering Congress, 417 Foxcroft Bldg., San Francisco, Calif.

INDUSTRIAL NEWS

The Sullivan Machinery Co., announces that its office in Boston is now Room 1010, Unity Bldg.

The California Slimes Extraction Co., of Sutter Creek, Calif., has recently purchased a 5x10-ft. adjustable quick discharge tube mill from Chalmers & Williams, Chicago.

The United Lead Co., 111 Broadway, New York, has succeeded in producing a lead alloy high in copper for use as bearing metal, etc., from which the copper will not segregate on cooling, no matter how many times remelted. It solidifies at 900° F.

Editorial Correspondence

SAN FRANCISCO—June 9

The Late Snowfall in northwestern mining counties, coming in May, will insure an abundance of water for hydraulic and dredging and other placer mining in Trinity, Siskiyou, and Humboldt Counties. The storms prevented the completion of bridges and necessary repair of roads until early in June. Bridges crossing Mad River and Trinity River have been completed and for the first time in the present year, traffic was opened June 2, between Red Bluff, Redding and Eureka. During the winter months the state road was closed to travel. Hydraulic mining in Humboldt and Trinity was in general uninterrupted except in the higher elevations where the storms were extremely heavy. The late snowfall in the Sierra between Placerville and Lake Tahoe has not been altogether encouraging. The greatest depth recorded was 44 in. in a drift just below Pierce Camp. At Echo Lake mail box the record was only 33 in. The extreme summit is entirely barren of snow. Between the summit and the 49-mile stone, the depth is from 24 to 42 in. The warm weather which prevailed practically all over the state with the beginning of June is likely to cause a greater rapidity of melting of the snow than is desirable by the mines dependent upon the snow in the Sierra. However, the indications are that the season will be by no means a dry one.

Lone Pine District, 14 miles northeast of Mohave, near what is known as Jawbone district, named after Jawbone Creek,' is attracting a large number of prospectors. These districts are new to the mining industry and are not included in the Geological Survey records. There has been a good deal of prospecting from a point south of Jawbone Creek northeasterly to the Cinco, Garlock, and Goler districts. The Garlock and Goler districts are situated north and northwest of Randsburg. The State Mining Bureau mineral maps show a scattering of gold northeast of Mohave, along the line of and west of the Southern Pacific R.R. A good deal of this country is pockety, and there are dry placers that have been tried out by various methods, but not with commercial success. Recently San Francisco men have taken options on what are known as dry-placer lands in the Randsburg district. The purpose is not to introduce dry-placer methods, but to bring water to the ground. Water may be developed in most of this region northeast of the Mohave, although in some instances it will be necessary to carry it a distance of 10 to 20 miles. The Yellow Aster mine at Randsburg has for many years been using water developed at Goler and Old Wells. There is no reason why other water may not be developed, not only in the Randsburg district, but in the region southeast of there. The great drawback to a large portion of this region is the intense heat during most of the year and the absence of water immediately available. Another thing that retards the progress of prospecting and development on the part of mining men of experience is that the local newspapers are inclined to exaggerate in recording the value of the ore disclosed. For instance, a recent item gives the value of $1000 per ton of ore in Lone Pine district. Another item credits Crede district in Lone Pine Cañon with ore from the Gold Peak mine at $33,000 per ton. These figures are ridiculous when meant to convey the idea that the districts produce ores in commercial quantity of such extraordinary value. But these stories need not deter sensible prospectors and careful investors from investigating the region.

BUTTE—June 11

When the Miners Decided to Get Along Without a Union and found that they were better off in dealing individually with the mining companies and thereby saved many dollars that they had been compelled to contribute monthly toward the maintenance of expensive officers of the Western Federation, there remained active in agitation and trouble only some of the trades unions in Butte, and to foster a little more independence among business men and business houses there was organized an Employers' Association to which practically all the business houses and merchants subscribed. It looked like a long-needed protective organization, and one that would bind employers with a tie of mutual interest, but on the very first issue with labor unions the new association divided and its purpose bumped on the rocks of fear. June 13 was Miners Union day, but the miners didn't care to observe it or celebrate it by claiming a holiday. They had had enough holidays and preferred to work at $4 per day. However, the Clerks Union, one of the most active of labor organizations in Butte, decided to observe Miners Union day whether the miners wanted to or not, and declared that on June 14 (Monday) all stores in Butte should remain closed and a resolution was adopted that every member of the union who worked on that day would be fined $5. The Employers' Association gave notice that all stores would be open on that day, but some members of the association, led by the new Claflin management of the Hennessy department store, decided to give in to the clerks' demands and declared a holiday. Others followed the action of the big store, and the Employers' Association was compelled to revoke its first order and agree to a general holiday. All the mines worked as usual. It was the first anniversary of the big labor riot in Butte which resulted in the dynamiting of the Miners Union hall, the disruption of the Miners' Union, the reign of I. W. W. terrorism, and the later reign of peace under martial law, and restoration of order.

DENVER—June 10

In Refutation of Newspaper Exaggerations George E. Collins, manager of the Mary Murphy mine, published in a Denver daily: There is not more than 100,000 tons of milling ore of a $15 value, blocked out in the mine above the 14th level; during no five-months' period in recent years have shipments averaged more than 1000 tons per month; reserves are insufficient to keep mill busy four years; operation of the mine for ten years is not assured; present mill capacity is 175 tons, not 100 tons, per day.

Investigation of Freight Rates is sought by Judge E. A. Colburn, of Denver, owner and operator of the Ajax mine and mill at Victor, who has filed complaint with the state commission on public utilities requesting an investigation of the rates charged by the Florence & Cripple Creek R.R. Co. holding a monopoly of the traffic in the Cripple Creek district. His accusation is that the schedule of rates is so unfair that ore cannot be transferred between points within the mining district as cheaply as it can be hauled to outside points, the effect being that his custom mill, at Victor, is unable to compete with the Golden Cycle mill at Colorado City.

SALT LAKE CITY—June 11

A Flotation Plant will be installed by the Silver King Coalition of Park City. Experiments and tests have been carried on for some time. The new plant, which will occupy one section of the present mill, has been designed to treat the sulphide milling ores, now being obtained in increasing quantity below the Alliance tunnel level, and in the new workings below the 1300 level in the southwestern part of the mine. The new plant will consist of Callow flotation cells similar to those being used at Mullan, Idaho, and installation is to be started at once. The initial capacity will be 60 tons. The present Silver King mill is treating in the neighborhood of 250 tons of ore daily, largely mixed carbonate and sulphide ore. It is unofficially announced that the regular quarterly dividend of 15c. a share amounting to $187,500, will be paid July 1. Earnings have been largely increased by the advance in the price of lead.

The Ohio Copper Property at Bingham and Lark has been leased to the General Exploration Co., which filed articles of incorporation June 9. The lease covers all property of the company, and work is to be resumed at mine and mill at once. The new company will finish installing the crushing equipment that was being put in the mill, when the property closed down. In September, 1914, the Ohio Copper Co. filed a voluntary petition in bankruptcy. The assets, consisting of mining property, were valued at a million dollars, and copper in possession of the American Smelting & Refining Co. was valued at $316,000. The liabilities were placed at $1,668,000. The United States district court of New York appointed Duncan MacVichie, Ernest Bamberger and H. L. Lamprecht as appraisers to place a valuation on the tangible assets of the company. A. Frank and M. H. Sowles were named by the trustees as local representatives of the company, when the petition in bankruptcy was filed. At this time copper was about 12 or 13c. a pound, and on account of the advance in the price of this metal, the company is reported to be in much better financial condition at present. The directors of the

General Exploration Co. are: Alfred Frank, formerly general manager and in charge of the Bingham Central R.R., Clarence Bamberger, and E. L. Newhouse, Jr., of Salt Lake City, John MacGinnis, of Butte, Mont., and C. W. Saacke, of New York.

SEATTLE—June 8

Tolovana Gold has an assay value higher than the gold from most of the creeks in the Fairbanks district. The clean dust is worth $18.75 an ounce.

Alaska Copper Belt is active on account of the stimulated market. The mines at Latouche, Kennecott and Ellamar are running to their capacity and the production will be greater this year than ever before in their history. Effective at once, the Copper River & Northwestern Ry. will run three trains a week each way between Chitina and Kennecott, instead of maintaining the usual summer schedule of one train a week. This has become necessary on account of the increased shipments of copper ore from the Bonanza and Jumbo mines which the branch line is unable to handle. Two trains a week will be operated between Cordova and Chitina. With the continued rise in the price of copper the output of these mines is to be still further increased to 120 cars, or 6000 tons a month. At the present price of copper this month's ore shipment will have a value of over $1,500,000.

Opening of Navigation in interior Alaska has brought no slackening of interest in the Tolovana district, notwithstanding the report of Mine Inspector Maloney, generally regarded as pessimistic. Mr. Maloney's opinion is that a small camp, such as Hot Springs, Circle and Koyukuk will eventually be developed, but that there is little chance for a camp comparable with Nome, Fairbanks, and Iditarod. The steamer "White Seal" will make regular trips on the Tolovana River to the head of navigation; she has recently been equipped with tackle for removing the large amount of drift and the log jams that at present obstruct the river. Lake City is being abandoned in favor of Discovery townsite, situated at the head of navigation. Lynch, Stone & Verdi, on Olive Creek, have placed their machinery and erected the gin-pole, and are ready to hoist pay. Just below them Gus Peterson is working with a crew of 20 men. There is great activity on Livengood. Patterson is sinking on his lay on the Cascaden-McCord ground; Wagner has reached depth of 80 ft. on 2 Above Discovery, second tier; Berg & Sullivan are sinking on 3 Above. An unverified report is current that pay has been found on Alabam Creek.

HOUGHTON—June 10

Copper Production in the Lake Superior District—While the copper mines of this district are at present breaking some of their best records in monthly rock tonnages and in refined outputs of copper there seems to be a too general inclination to overestimate not only the copper outputs but the earning capacities of all of the mines. In figuring the records for the year 1915 it is unfair to take a May or June record either for production or for price received. The first three months of the year did not show so well as the second three-month period likely will. If the third and fourth quarter of the year show up in comparison with the second, some remarkably good figures can be made, but that is presuming on unusually high price and top-notch production records. Friends of the Calumet & Hecla company, for instance, are publishing figures showing that the output of the old mine alone will be over 100,000,000 lb. this year and some estimate the output of the Calumet & Hecla and subsidiaries as high as 180,000,000 lb. These figures are undoubtedly secured by estimating each property at the top-notch figures of its most enthusiastic shareholders. As a matter of fact the total production of copper from the Calumet & Hecla and subsidiaries, for the year 1915, with good fortune and no unforeseen difficulties, will probably reach 144,000,000 lb. This is a fairly reasonable production based on present performances and considering the fact that the first quarter of the year did not show present outputs. Figured at the rate for the first four months it would amount to 124,000,000 lb. Figuring the other eight months at the May rate the total would be nearer 140,000,000 lb. Of this total it is fair to figure Calumet & Hecla alone at not more than 72,000,000 lb. This figure is generally overestimated. Ahmeek can fairly be estimated at 22,000,000 lb. Allouez has now reached the maximum of expectations for the year and is making a fine showing and can be counted on for 10,000,000 lb. for the year. Isle Royale will produce 8,000,000 lb. with good luck. The rock is running close to 14 lb. to the ton at the present time. There will be no difficulty in Osceola producing 18,000,000 lb. It would be unfair to expect Centennial to run over 3,000,000 lb. Centennial is a small mine, of limited acreage and limited workable territory. It is now producing the highest grade of rock in its history with the exception of one month. In October, 1907, Centennial sent to the mill 19,500 tons of rock. In May this year it sent down 15,180 tons of rock carrying better than 16½ lb. to the ton. Superior's production and that of Tamarack will be about 4,000,000 each, although in the case of the latter there is a possibility of some better results. White Pine is producing steadily. Three cargoes of mineral have come down from the mine to the smeltery since operations began. It is necessary to wait for continued dry weather to get the barrels of mineral from the mill to the lake shore for scow shipment. The White Pine rock is yielding 30 lb. of refined copper to the ton. The losses in the tailings in the mill are about 13 or 14 lb. to the ton, owing to the light weight flaky mineral. Ultimately this will be saved by the installation of special equipment. In the meantime the showing of copper is likely to be better rather than lower, for the reason that the first output came very largely from the stock piles. Now more of it is coming from the stopes in the mine. It is reasonable to figure that the White Pine will produce 3,000,000 lb. of refined copper this year. The returns from this will be applied immediately to the payment of the indebtedness to the Calumet & Hecla, the parent company holding preferred stock representing the outlay in building the plant, erecting the mill and putting the White Pine on its feet.

ISHPEMING—June 9

E. J. Longyear Co. has taken a contract to sink a shaft to a depth of 1200 ft. near Christiania, Norway. M. E. Richards and Capt. William Holman, of the Judson Mining Co. at Alpha, have drawn up the plans and made the arrangements. Capt. Holman and 60 miners from Marquette range will sail from New York during June to start work. He will be abroad until the work is well under way. The contract is to be completed in a year's time. American machinery will be used on the work. The American company was allowed to submit a bid in order that something might be learned of American methods of shaft sinking. The miners will receive good wages and will be paid from the time of leaving until they return. They will receive a bonus for all footage over 65 ft. per month. Over 300 miners applied for positions.

CUSHING, OKLA.—June 10

Producers in the Cushing, Okla., Oil Field are said to be greatly worried by the presence of large quantities of sulphur in the crude. Heretofore refineries which could work entirely on Cushing crude were considered to have an advantage over all others. Now they will probably be at a disadvantage.

KINGMAN, ARIZ.—June 9

Much Excitement in the Kingman District of Arizona was recently caused by the discovery that the ore waste from the Columbia mine was a telluride ore, running from $50 to $300 in gold and silver per ton. When the news of the chance discovery reached Kingman there was a big rush of prospectors to the Wallapai Spring section where the mine is located. All the ground for several miles around the Columbia mine was staked out in a few hours. The mine is owned by Messrs. Frost, Mehaffy and Myers. For some time they had been working a pay streak of galena ore, the remainder of the material that came out of the shaft being thrown away. Some of this waste was assayed and it was found to be exceedingly rich.

TORONTO—June 12

Toluol and Trinitrotoluol—The Dominion Steel Corporation has been for some time manufacturing toluol as a by-product for the British War Office, to be used in the manufacture of trinitrotuluol, a high explosive. Some months since the company was asked to carry the process further and produce the finished article. It is now announced that this has been done and that trinitrotoluol is now being manufactured at the Sydney plant. Toluol is being produced at the byproduct coke-oven plants at Sydney and Sault Ste. Marie, and it is understood that its manufacture will also be undertaken at Hamilton, and by the Crows Nest Pass Coal Co., at Fernie, B. C.

The War and Financial Depression have caused a great falling off in prospecting and the development of claims in the mining areas under the jurisdiction of the Federal government. Last year prospectors had little difficulty in getting grub-staked and many oil finds in the West were recorded. From May, 1914, to May, 1915, upwards of 12,000 oil claims and 2000 mineral claims were filed at the Department of Mines at Ottawa, but these were all for discoveries made before the war. There is now a marked decrease in the number recorded. There are also numerous applications for an extension of time for doing the development work required during the first year. Recently important discoveries of oil have been made around Great Slave Lake but owing to lack of available capital the claims remain unworked.

The Mining News

ALASKA

NO. 1 ABOVE DISCOVERY, ESTER CREEK (Fairbanks)—Sullivan & Ollsen, lessees on 1 Above, Ester Creek, are working 40 men and are hoisting 175 buckets of gravel per day. They are also sluicing two dumps taken out during winter.

VALDEZ (Valdez)—Work will be commenced immediately to open up vein. Contract has been let to Ted Johnson and associates to run 200 ft. of tunnel near Valdez glacier. Because of recent excellent showing on Ramsay-Rutherford group adjoining, it is expected that valuable ore will be uncovered on this property.

GRANITE GOLD (Valdez)—Big tunnel to tap lead at depth of 500 ft. now in distance of 400 ft. and double shifts are completing work which is opening up large orebodies. There is now sufficient ore ready to operate new mill for eight months. Will be started up as soon as millman arrives from outside. New 10-stamp plant will bring daily capacity of mill to between 60 and 70 tons.

KENNECOTT COPPER (Kennecott)—Bonanza mine of this corporation said to have produced copper for some years at cost of 4½c. per lb., the lowest cost in the world; has produced to date 90,000,000 lb. of copper. The Jumbo and Beatson mines have both entered producing class. Combined production of three expected to be about 5,000,000 lb. per month.

MIZPAH (Fairbanks)—Thompson, Geis & Hess, owners of Mizpah quartz claim, situated on left limit of Fairbanks Creek near mouth of Too Much Gold Creek, are installing hoist. Recent run at Heilig custom mill returned $1150 from 14 tons of ore. Operators estimate that they have 800 tons of ore of similar grade developed above 80-ft. level, and it is planned to mine this before proceeding with other development work.

7 ABOVE, CHICKEN CREEK (Chicken)—First application to be filed at Fairbanks for permission to mine coal under recent Federal regulations made by Geo. A. Eastebrook, Forty-mile district. Coal vein is in ground held as placer claim 7 Above Discovery, first bench, right limit, Chicken Creek. Applicant asks permission to mine coal under five-acre tract, which has been granted.

ARIZONA

Cochise County

PHELPS, DODGE & CO. (Tombstone)—Now has working force of about 400 men employed upon its properties in this district.

CALUMET & ARIZONA (Warren)—Tucson, Cornelia & Gila Bend Railroad has been organized to construct railroad from Gila Bend on Southern Pacific to Ajo to give an outlet to mines of C. & A. Will be 42 miles long. Ownership of railroad will be equally divided between Phelps-Dodge and Calumet & Arizona.

Gila County

MIAMI (Miami)—Production for May approximately 3,600,000 lb. of copper, largest monthly production yet made by company. Is expected output will be increased to 4,000,000 lb. by August.

INSPIRATION (Miami)—On steel headframe at Main West shaft crew of iron workers busy for last two weeks making changes and additions necessitated by decision to use Otis elevator for hoisting men. Coarse-crushing plant has been "limbered up" and can be put into commission as soon as new mill is ready. For conveying compressed air into mine 14-in. pipe line will be provided in shaft. From this line 10-in. branches will be taken off on haulage levels.

Greenlee County

SHANNON (Clifton)—Produced 1,028,000 lb. of copper in May, which is about normal production, at cost said to be about 12½c. per pound. Production will be maintained at around 1,000,000 lb. per month.

ARIZONA COPPER (Clifton)—Company is proceeding with remodeling its No. 4 mill at Clifton, which will treat 500 tons of ore daily and is also making some changes in No. 6 mill at Morenci, which will increase capacity of this mill by 500 tons per day.

Mohave County

GERMAN-AMERICAN PIONEER CONSOLIDATED (Kingman)—Has sold its group of mines to Joseph Winchester, of Cripple Creek, Colo., and associates. Property is equipped with 10-stamp mill and water-supply system. Although large quantities of milling ore were developed in mines, operations were suspended several years ago on account of differences that arose among stockholders. It is planned by new owners to carry on extensive operations.

Yavapai County

HARRY PARKER (Clarkdale)—Has purchased Custer and Arkansas claims near Jerome from R. Rothemel and M. D. Ross. Consideration was $50,000.

BIG PINE CONSOLIDATED (Prescott)—Considering change in crushing end of mill using 10-ft. new-style Lane mill instead of Chilean and tube.

UNITED VERDE EXTENSION (Jerome)—During May 90 tons ore averaging 48% copper were shipped to United Verde smeltery. Shipments have been temporarily discontinued. Shipments to date have amounted to $150,000.

UNITED VERDE (Clarkdale)—Has arranged to operate Copper Giant mine, situated eight miles east of Hackberry, Ariz. It plans to extract and ship about 50 tons of ore daily to its new smeltery.

CALIFORNIA

Amador County

BUNKER HILL (Amador City)—The 2400 level will be retimbered and raises driven to 2200 level. Installation of Hardinge mills is contemplated, in order to increase the tonnage.

CENTRAL EUREKA (Sutter Creek)—Thirty of 40 stamps are dropping on good ore from lower levels. Repairs in shaft completed. Sinking below 3100 level will begin soon. James A. Davis, superintendent.

Calaveras County

VICTOR LAND & MINERAL (Angels Camp)—Arrangements are being made for settlement of debts and re-opening of Reiner Mine. Directors of the company are F. W. Clough, J. T. Dickie, Ralph Lemue, of Angels Camp; E. H. Ehrler and A. E. Haid, of St. Louis.

Eldorado County

GREENWOOD (Greenwood)—Test runs of old mill tailing are being made to determine whether values will warrant installation of mill. Property is operated by Turlock men.

IVANHOE (Garden Valley)—Tremain two-stamp mill and Hendy concentrator are in operation. Steam and gasoline power are used. Reported that equipment will be improved if development warrants.

SELBY (Diamond Spring)—Mine recently bonded to Eastern men. Present development consists of 240-ft. double compartment shaft. Peacock Copper mine situated parallel to, and 500-ft. east of Selby, is included in bond.

Inyo County

WILSHIRE BISHOP CREEK (Bishop Creek)—It has been necessary to install new 100-hp. motor for tube mill. New bunk house completed and cabin and tent houses are under construction. There are 53 men on the payroll.

Kern County

SHIPSEY (Randsburg)—Recent cleanup from King Solomon of 49 tons of ore totaled $3600.

MINNEHAHA (Randsburg)—Ore averaging $25 per ton recently disclosed. Mine adjourns Yellow Aster and was formerly producer. Development has been in progress about two months by Wilson Jones and Jerry O'Leary.

Modoc County

MODOC MINE (High-Grade)—Will drive cross-cut tunnel 2238 ft. to connect with shaft at 500 level. Having run into sulphide, mill project is deferred until final character of total orebody is permanently established.

Nevada County

EMPIRE (Grass Valley)—New 60-stamp mill has been formally accepted by company. Mill was built by Robert Hathaway, of Nevada City. George W. Starr is superintendent.

RAGON FLAT (Grass Valley)—After cleaning and unwatering incline shaft company has surrendered bond and machinery will be removed. Mine is owned by Robert Nye of Grass Valley.

Trinity County

GLOBE CONSOLIDATED (Dedrick)—Operating Globe-Chloride-Bailey gold mines at Dedrick. Is running milling plant only intermittently.

San Bernardino County

CALIFORNIA-TRONA—U. S. Circuit Court of Appeals in San Francisco affirmed injunction granted in Los Angeles against this company. Order restrains Thos. W. Park, Stella Schuler and Joseph K. Hutchison from interfering with 15 placer claims at Searles Lake.

COLORADO

Clear Creek County

LAKE (Idaho Springs)—Development along this vein that produced heavily during last winter has opened another shoot, 2 ft. thick, running $30 per ton.

HUDSON MILL (Idaho Springs)—S. P. Warren, E. M., has completed series of experiments in oil flotation on local ores and orders have been placed for equipment to handle custom ores by this process.

Lake County

PENROSE (Leadville)—Each of new electric centrifugal pumps working without interruption, except for occasional 30-min. stops to lengthen its column; capacity more than 2000 gal. per min. Water level in downtown mines has been lowered about 160 ft.

PONSARDINE (Leadville)—Sulphide orebody recently disclosed by caving in of old workings that have been unwatered by Downtown Pumping project has been partially explored. It is known to be at least 15 ft. thick and 70 ft. long, running 23 to 31% zinc and 19% lead. Owners are seeking market for this kind of ore.

San Miguel County

TOMBOY (Telluride)—During May mill ran 29 days and crushed 12,000 tons ore which yielded $47,500. Concentrates shipped brought $55,500. Expenses for period $60,500 leaving operating profit $42,500.

Teller County

DANTE (Victor)—Mill is treating 2000 tons of $2 ore per month at fair profit.

ALPHA-OMEGA (Cripple Creek)—Will be equipped with small hoist and 6-drill electric-driven compressor.

EL PASO (Cripple Creek)—May production was greatest for any month in several years, viz., 2080 tons having gross value of about $20 per ton. Several new leases have been granted recently.

STRATTON'S INDEPENDENCE (Cripple Creek)—According to London advices, production for April was 5489 tons of ore averaging 6 dwt. 12 grains per ton. Low-grade mine and dump ore milled, 8387 tons. Net profit to company, $8000.

IDAHO

Shoshone County

TERRIBLE EDITH (Murray)—Under lease to Charles Conn & Son, of Butte. Shipped recently several cars of concentrates assaying over 51% zinc. Silver values not as high as in many of Cœur d'Alene properties.

HERCULES (Burke)—Mine closed down because of expiration of smelting contract with A. S. & R. and inability to agree on terms of new contract. Contract just expired said to have been most advantageous smelting contract in the Cœur d'Alenes, being several dollars lower than Bunker Hill & Sullivan's. Hercules seriously considering erection of smelting plant.

NATIONAL COPPER (Mullan)—Considerable force of men working at property reopened last week after several months' idleness. Shaft sinking will be started. Operation of 500-ton mill completed just before mine closed down, will depend upon further developments underground.

INTERSTATE-CALLAHAN (Wallace)—New tramway from mill to Sunset station will be in operation early in July. Foundations for towers are completed and towers are all framed, and will be erected and in readiness for cables and other fixtures when they arrive.

MICHIGAN

Copper

LAKE (Lake Mine)—Work of unwatering shaft is progressing rapidly.

MASS CONSOLIDATED (Mass)—Now shipping 2000 tons of rock daily; largest output in history of property.

COPPER RANGE CONS. (Painesdale)—Furnishes all copper used by American Steam Gauge & Valve Mfg. Co., which has just received $1,000,000 war order.

AHMEEK (Ahmeek)—Additional head at stamp mill has been started, making five heads now operating on Ahmeek rock, and means daily tonnage of about 3300 tons. Will be three months before sixth head is ready for operation. Ahmeek is sending up highest-grade rock ever mined from this property. At North Ahmeek working force numbers 90.

CALUMET & HECLA (Calumet)—At old mine, adding to the underground forces every day. Rock tonnage larger now than ever in history of property. Shipping over 11,000 tons of rock daily. Two ton shipments of silver sent to New York this week. No. 2 regrinding mill is working successfully on the sand pumped up from big pile in lake.

MOHAWK (Mohawk)—Will this summer erect complete electric power and lighting plant to operate from No. 1 to No. 6, extreme north and south ends of property. Line, poles, wires, etc., will be owned, erected and cared for by company. This will bring about reduction in rate for power and light furnished by Houghton County company. Poles are now on the ground. Electricians now at work installing underground telephones throughout mine. Officials were figuring on electric pumps but on account of small amount of water this subject was dropped. There is large amount in No. 6 but very little in other five. Electric haulage underground is likewise possibility of the future.

Iron

FORBES (Iron River)—Orders have been received from Jones & Laughlin to ship all of ore in stock and all that is being hoisted. Monthly production is now 12,000 tons.

CRYSTAL FALLS—Shovels are working off and on at the stockpiles of Dunn, Bristol, Tobin and Great Western mines. It looks as though large amount of ore in stock would be moved this year.

NEGAUNEE (Negaunee)—Sales of ore totaling 300,000 tons have been made for this property. Over 200,000 tons will be taken by Lackawanna Steel Co.; remainder is for Michigan blast furnaces. All of ore in stock will be moved.

HEMLOCK (Crystal Falls)—All of machinery has been removed and mine sealed for all time. Ore is exhausted. Big Gates crusher has been shipped to Balkan at Alpha. Remainder of machinery will probably be used at Warner, when mining is started there.

GREAT WESTERN (Crystal Falls)—Steam shovels have finally attacked large pile of low-grade ore which has been in stock here for years. It is stated that half of pile will be moved. Mine has been idle for several years but has considerable ore underground.

MINNESOTA

Duluth

WARRIOR DEVELOPMENT CO., controlled by Congdon interests, will hold stockholders meeting in Arizona to decide upon dissolution and distribution of assets. Distribution will give each share of stock approximately $1 cash and one-tenth share of Rainbow Development Co.'s stock, which latter company controls property in Butte, Mont.

RAINBOW DEVELOPMENT CO., at annual meeting held June 1 following officers elected: E. C. Congdon, pres.; C. A. Congdon, vice-pres.; Frederic R. Kennedy, secy.-treas.; Thos. F. Cole and Joseph B. Cotton, directors. Company voted to issue general mortgage 6% convertible bonds for $400,000 and to increase shares from 80,000 to 150,000, par $10. Property in Butte, Mont.

MISSOURI

CATHERINE (Fredericktown)—Under lease to Federal Lead Co. has been unwatered and is again in operation.

MINE LA MOTTE (Fredericktown)—Belt on flywheel of mill engine broke resulting in engine running away and bursting flywheel. Mill badly damaged. One half wheel held together and went through roof going and coming. None of workmen was killed, but two were seriously injured. Company has largely increased output of lead by construction of mill to handle lead ore contained in soil and clay around old surface and shallow diggings that were supposed to be of no further value. Two Thew steam shovels are not sufficient to keep this mill supplied, so third shovel has been purchased and another locomotive. Also planning to erect another and much larger mill to handle mine ore. About 700 men are now employed.

MONTANA

Broadwater County

BLACK FRIDAY (Radersburg)—Extensive development work being done, consisting of 200 ft. of drifting from 400 level and 100-ft. upraise from 400 to 300 level, contract for which has just been let. Gold ore valued at $40 per ton has been recovered from 200 level. When work of extracting ore is actively taken up concentrator will be built along lines of present testing plant which has demonstrated 90% recovery. Ore recovered in course of development being shipped to Washoe.

Lewis & Clark County

BARNES KING (Marysville)—Announced that company has concluded negotiations with owners of Shannon mine near Marysville, by which company will take over that property on favorable terms. If mine justifies expectations, cable tramway will be installed to take ore from Shannon mine to new Gloster mill, distance of about 2½ miles.

Silver Bow County

BULLWHACKER (Butte)—An extensive cave-in in workings, produced by heavy rains caused temporary closing down of operations to allow repairs to be made. Mine has been shipping about 40 cars of ore monthly to Anaconda. Is expected to increase output to 4500 tons per month.

TUOLUMNE (Butte)—Letter addressed to stockholders by president asking them to loan money to company at 8%, to furnish working capital amounting to $35,000 so that mining operations may be resumed. Stated that considerable amount of ore blocked out in mine can be taken out at profit at present prices.

BUTTE-BALLAKLAVA (Butte)—Arrangements completed to increase output by about 25% for month of June. Total tonnage for May little more than 4000 tons. Grade of ore above 3% copper and 4 oz. silver. From 1600 level winze now being sunk to 1700 level, has opened up 5 ft. of ore, assaying 5½% copper and 7 oz. silver. About 90 men are at work.

PILOT-BUTTE (Butte)—Restraining order issued short time ago in suit of Anaconda against Pilot-Butte modified by Judge Lynch so as to permit plaintiff to do necessary work in preparation for hearing of case in near future. Order allows sinking of winze from 2000 level of vein in dispute to 2400 level with some drifting on vein. Anaconda company agreed to store ore extracted or sell it at market price and account for returns.

BUTTE & BACORN (Butte)—Supreme court issued writ of supervisory control, returnable Sept. 20, in case involving this company on application of Frank F. Whitman of Butte, minority stockholder, who seeks to intervene in suit brought by Fred Bacorn against Butte & Bacorn company to quiet title to 30-year lease. Alleged that lease was obtained through collusion and fraud upon part of Bacorn. Under lease company receives royalty of 8% payable in ore delivered on dump. In lower court application of Whitman was denied and lease was sustained.

ANACONDA (Butte)—May output was 20,500,000 lb. copper. This is largest for any month this year but less than any month for corresponding period last year. May production 1914 was 23,500,000 lb. Poulin mine has been closed so far as mining operations are concerned to permit sinking shaft to deeper level. Mine employs about 200 men. Output has been about 250 tons per day. Shaft is now 1500 ft. deep. How much deeper it is to be sunk has not been announced. Original mine of Anaconda closed for several weeks, resumed operations, adding 1000 tons of ore to daily output of company. Concentrator at Great Falls which it was not expected would be used again will be immediately put into commission.

NEVADA

Elko County

BLUSTER (Jarbridge)—New 10-stamp mill completed and ready for operation.

NEVADA COPPER M. M. & P. (Contact)—Site for flotation mill decided on near Mammoth and New York properties. Diesel engine ordered for generating power.

Esmeralda County

SOUTHWESTERN MINES (Hornsilver)—Formerly Great Western planning to erect mill on property. S. H. Brady, formerly manager of Tonopah Belmont and other Tonopah mines, is vice-president and general manager.

MERGER MINES (Goldfield)—Statement made by George Wingfield that all differences between minority and majority stockholders adjusted. Papers to end litigation prepared. Deep Mines Co. will be dissolved. Directorate of Merger will be reorganized.

Humboldt County

HONEY BEE (Willard)—Block No. 2 leased to Reno men. Lease calls for 150 ft. of development work, 100 ft. of which is to be sinking. Six-foot shoot shipping-grade opened in shaft on company ground. Tunnel now being driven to cut shoot at depth of 200 ft. Smelter returns on 50 tons ore shipped recently gave $940 net.

ROCHESTER MINES (Rochester) — Second bullion shipment made recently; clean-up from 16 days mill run, valued at $26,000. Two suits filed in district court, by stockholders, against company in an endeavor to prevent an increase of capitalization for purpose of purchasing Weaver group. Temporary restraining order has ben asked for preventing any increase of capital stock or purchase by company of Weaver group. Appointment of receiver is also prayed for to manage affairs of company until suit is settled.

Nye County

TONOPAH ORE PRODUCTION for week ended June 5 amounted to 10,645 tons valued at $217,570 compared with 11,001 tons valued at $223,978 week previous. Producers were: Tonopah Belmont, 3445; Tonopah Mining, 2900; Tonopah Extension, 1830; West End, 856; Jim Butler, 1150; Tonopah Merger, 401; and North Star, 63 tons.

SUNSET (Rhyolite)—Mill running steadily on $6 ore will be increased from 50 to 100 tons.

MONITOR-BELMONT (Belmont)—Rapid progress being made in construction of mill. Oil flotation will be used. First unit to have capacity of 150 tons per day. Dump ore will be treated; of this 50,000 tons will assay $10 per ton.

Lincoln County

PIOCHE ORE SHIPMENTS for the week ended June 9 totaled 80 cars estimated at 4000 tons, valued at $45,000, compared with 62 cars the week previous.

Mineral County

SCOTIA (Terrill)—Announcement made from Boston office that operations will be resumed. Milling plant may be built. Ore uniformly good-grade, assaying $15, with pockets of high-grade. Work discontinued several months ago when engine house burned.

SOUTH DAKOTA

Lawrence County

ECHO (Maitland)—Large amount of water at 100 level has caused suspension of operations. Compressor of large size will be installed to furnish air for pump.

WASP NO. 2 (Flatiron)—Fire destroyed hoist and building but did not cause decrease of tonnage. Ore which was hoisted from underground workings by this equipment is now sent through opencut workings and there hoisted by main tram. Considerable tungsten ore is being taken out in new workings and will be shipped.

Pennington County

BLACK HILLS TUNGSTEN (Hill City)—Mill under lease has been put into operation on concentrating of tin ore. Mill has been remodeled and good concentrate is now obtained.

HOMELODE (Silver City)—Second shaft is nearly 100 ft. deep and as soon as reached, connections will be made with main shaft. Plant for treatment of ore will be erected this year.

UTAH

Beaver County

PALOMA GOLD & SILVER (Milford)—Lead-silver ore 1½ ft. thick has been cut on 325-ft. level. New hoist capable of sinking to 600 recently installed. Compressor is being considered.

Juab County

TINTIC ORE SHIPMENTS for May amounted to 540 cars, estimated at 27,000 tons valued at $700,000, compared with 580 carloads in April, 356 in March, 297 in February and 430 in January. With exception of old Mammoth mine, which had made little effort to ship until May, none of largest producers equaled their outputs in recent months. Individual shippers were: Sioux mill dump, 124 cars; Centennial-Eureka, 80; Iron Blossom, 77; Mammoth, 43; Chief Con., 42; Eagle & Blue Bell, 39; Gemini, 24; Dragon Consolidated, 18; May Day, 17; Grand Central, 13; Lower Mammoth, 12; Gold Chain, 8; Eureka Hill, 7; Colorado, 6; Beck Tunnel, 5; Bullion Beck, 5; Yankee Consolidated, 4; Victoria, 3; Carisa lease, 3; Godiva, 3; Uncle Sam, 2; Opohongo, 1; Black Jack, 1; Minnie Moore lease, 1; Sioux Consolidated, 1; Copper Queen, 1; Total, 540.

CHIEF CONSOLIDATED (Eureka)—Compressor to be used in diamond-drilling on North Tintic claims, recently acquired, has been received. Assessment work calls for an expenditure of $23,000.

EAGLE & BLUE BELL (Eureka)—New electric equipment capable of sinking to 2500 level has been ordered. As soon as new equipment has been installed, shaft will be sunk 200 ft. below 1700 level.

IRON BLOSSOM (Silver City)—Winze being sunk from 600 level in north end of property, and some drifting has been done at 100-ft. point, although ground will be more thoroughly prospected at greater depth. Diamond drilling is in progress on the 1900 level.

GEMINI (Eureka)—As soon as pumps have been placed in operation work will start here and in adjoining Ridge & Valley, where shipping ore has been left in section at present under water. Drifting in Ridge & Valley will be done under contract. About 100 leasers are working at Gemini.

UTAH-APEX (Bingham)—Now producing at rate of over 30,000,000 lb. lead per annum. Expected to increase production to 40,000,000 lb. by installation of flotation process at expenditure of about $20,000.

Summit County

PARK CITY ORE PRODUCTION for week ended June 5 were 1740 tons valued at $69,000 compared with 1744 tons week previous.

SNAKE CREEK MINING & TUNNEL (Park City)—Tunnel now in 11,192 ft. During May, 330 ft. were made, and better progress is expected. Tunnel is in diorite, which breaks well and requires no timbering. Ground was drier than usual; present flow at portal is 17 sec.-ft. or 8000 gal. per min.

Washington County

THE TOWN OF GOLDSTRIKE continues to grow; lots have been sold, and buildings will be erected as fast as lumber can be brought in. A two-story hotel, a restaurant, billiard hall, drug store, and hospital are planned.

BEE BEE (Modena)—Development on this property at Goldstrike has opened ledge 5 ft. wide. Three-stamp mill has been ordered similar to one already operating in camp. Bee Bee ore carries up to $19 gold per ton.

GOLDSTRIKE CONSOLIDATED (Modena)—This company has taken over Enterprise group 4000 ft. northeast of Hamburg; and drifting is being done from bottom of 135-ft. shaft. Ore carrying silver and gold has been opened.

GOLDSTRIKE BONANZA (Modena)—This company, organized with capitalization of $100,000, has begun work on a 500-ft. tunnel to prospect what is thought to be western extension of Hamburg vein, about mile west of Hamburg claim. H. G. Snyder is president.

WISCONSIN

Grant County

LOOMIS (Platteville)—Small milling plant being erected on lease adjoining West Hill.

WEST ENTERPRISE (Platteville) — Churn drilling has proved up run of zinc ore on McGregor land in city limits, under lease to Kistler and Stephens.

Lafayette County

VINEGAR HILL (New Diggings)—Has sub-leased Murphy and Blackstone tracts, at New Diggings, and begun development work where recent discoveries were made by churn drill.

WISCONSIN ZINC (New Diggings)—Work of building new roaster of Skinner type has been started. Shaft sinking has been started on C. A. Thompson lease and an option taken on Sally Waters property, both at New Diggings.

CANADA

Alberta

SOUTHERN ALBERTA (Calgary)—This company has encountered oil in large quantities at depth of 3527 ft. in well two miles north of the Dingman well. It will sink second well in same vicinity.

British Columbia

ROCHER DE BOULE (Hazelton)—Shipments of 400 tons per week to be increased to 100 tons per day. Shipments go to Anyox smeltery.

CONSOLIDATED MINING & SMELTING (Trail)—Shippers to smeltery for week ended June 5 were 13, compared to 19 week previous, but tonnage was greater; 8027 tons being treated.

Ontario

ORE SHIPMENTS OVER THE T. & N. O. RY. for the month of May were from Cobalt proper: Beaver, 42 tons; Chambers Ferland, 133; Cobalt Comet—By Dom. Red Co., 63; Cobalt Laboratory, 8; Coniagas, 74; Crown Reserve—By Dom. Red. Co., 99; Kerr Lake, 30.37, by Dom. Red. Co., 57.20, 87; La Rose, 127; McKinley-Darragh, 211; Mining Corporation of Canada, Ltd.—Cobalt Lake Mine, 78.68, Townsite City Mines, 318.01—395; Nipissing, 64; Penn Canadian, 66; Peterson Lake (Seneca Superior ore), 65; Temiskaming, 40; total silver-ore shipments, 1482 tons. From South Porcupine, Dome Lake, (gold), 41 tons; From Schumacher, Vipond, 1.66 tons. From Porquis Jct., Alexo Mine (nickel), 982 tons.

CHAMBERS-FERLAND (Cobalt)—Connection has been made with Northern workings of Nipissing at 350 level, which will give better ventilation to drifts of both mines.

PORCUPINE PREMIER (Porcupine)—F. G. Wright of New York has arranged for development of this property. Shaft will be sunk 100 ft. and crosscuts run east and west to cut large sulphide body which shows good gold contents at 30 and 40 ft.

McINTYRE (Porcupine)—At 600 level of No. 4 shaft orebody measures 26 ft. wide, assays $10 per ton. On north side of property No. 5 shaft is down 400 ft. At this level vein has been opened up for 150 ft. and is 30 ft. wide in some places. Vein has been proved by diamond drilling to further depth of 100 ft.

MOND NICKEL (Sudbury)—Is building third furnace. This will make two new smelting furnaces since war started for this district for Canadian Copper has already added another one to their plant. Mt. Nickel mine, few miles north of Sudbury, is being operated under lease by Holmes & Travers. Ore is being smelted by Mond Nickel.

MEXICO

Sonora

GREENE-CANANEA (Cananea)—Reported that operations will be resumed at once. Mines and plant kept in good condition since shut-down last August. In 1913 produced 44,480,000 lb. copper at cost of slightly under 9⅝c. per lb.

SOUTH AMERICA

Chile

BETHLEHEM STEEL (Tofo)—It is expected to deliver ore from mines in Chile to its furnaces in South Bethlehem at cost of 6½c. per unit of iron.

BRADEN (Rancagua)—Production for May 2,364,000 lb. of copper, smallest for any month thus far in 1915. Total for five months 12,696,000 lb. compared with 11,789,000 lb. during corresponding period last year. Alterations in mill practically completed, making the capacity 4500 tons per day

AFRICA

Transvaal

GOLD PRODUCTION in the Transvaal in May is cabled as 763,548 oz., which is 19,468 oz. more than in April and 43,319 oz. more than in May, 1914. For the five months ended May 31 the total reported is 3,368,921 oz. in 1914, and 3,652,768 oz. in 1915; an increase of 283,847 oz. this year.

The Market Report

Metal Markets

NEW YORK—June 16

Copper was stronger during the last week. Spelter declined steadily. Tin had a sharp rise and then relapsed. Lead rose to the high point of the movement and then started to decline as rapidly as it had gone up.

Copper, Tin, Lead and Zinc

Copper—In the early part of the week a rather large business was done, the market gradually becoming established on the basis of 20@20¼c., regular terms, equivalent to about 19.80@20.05c., net cash, New York. The Wall Street and daily papers have had it higher, but that was not the fact. In the latter part of the week the market turned dull and some copper was to be had at 20c., r.t., while the principal sellers were asking 20¼.

Copper Sheets are understood to have brought 25@26c. per lb. The principal manufacturer has withdrawn all quotations. Wire is quoted at 21@21½c. per lb. at mill.

Copper Exports week ended June 5 are reported by the Department of Commerce at 13,180,000 lb., the larger items being 6,251,000 lb. to France, 4,318,000 lb. to Italy and 2,232,000 lb. to Great Britain. Imports were 8,438,000 lb. metal and 726,000 lb. in ore and matte; total 9,164,000 lb.

The Department of Commerce reports the imports of copper into the United States during the month of April as follows: Ore, 23,409 tons, copper contents, 6,262,244 lb.; matte, 1958 tons, copper contents, 1,485,245 lb.; pigs, bars, etc., 11,378,410 lb.; old, etc., for remanufacture, 577,685 lb.; composition metal, chief value copper, 18,288 lb.; total, 19,721,872 lb. Exports are given as follows: Pigs, ingots and bars, 55,682,592 lb.; plates and sheets, 1,696,438 lb.; rods and wire, 6,805,865 lb.; all other, 3,779,114 lb.; total, 67,964,009 lb. In addition there were 1604 tons of matte exported, valued at $15,534. This makes the total imports four months ended Apr. 30 this year 34,126 long tons; exports, 111,478 tons.

Tin—In sympathy with the rise in London there was a sharp advance in the price on June 14, a moderately large business being done, but on the following days there was a reaction. This is a narrow and sensitive market, which is affected sharply by stray currents of demand and supply.

Messrs. Ricard & Freiwald, London and Amsterdam, estimate tin supplies in May as follows: Shipments from the Straits, 6551; Australia, 173; sales of Banka and Billiton, 1523; arrivals of standard, 740; total 8987 long tons. Deliveries, United Kingdom, 2292; Holland, 82; other Europe, 1341; America, 6155; total, 9870 tons.

Lead—This market is difficult to quote. We can do nothing but give the range of daily transactions whereof we had reports. The A. S. & R. Co. made prices as follows: 6¼c. on the 10th, 6½c. on the 11th and 7c. on the 12th. These respective advances did not, however, equal the prices that were being realized by independent producers on the same dates. The St. Louis market was practically on a parity with New York. A rather large business was done during the first four days, but nowhere nearly so large as in the previous week. On June 15 the market began to be much disturbed by the attempts of speculators to realize, and on June 16 all of the producers were offering lead at the price of the A. S. & R. Co., while from speculative hands it was obtainable on much lower terms. There was talk of a 500-ton lot being offered at 6c. The market closed in a very unsettled condition.

In the early part of the week galvanizers were inquiring for lead in 1000-ton lots, but transactions did not develop, although several of them were buyers of smaller quantities. There is some skepticism respecting the ability of galvanizers to switch to the manufacture of terne plate overnight, so to speak.

Spelter—The weakness that was in evidence at the close of our last week of record continued steadily, the decline occurring upon relatively light business, most of the reported transactions being 100-ton lots, with only a few in excess thereof, and the aggregate of the business being comparatively small. The purchasing agents for manufacturers were conspicuous by their absence, while on the other hand there were plenty of sellers, not only for late deliveries, but also for early and prompt. In the morning of June 16 prompt was freely offered from several quarters at 20@20½c., while in the afternoon a fairly large lot was offered at 19c. The reapproachment of the New York and London markets resulted in at least one transaction for export on June 16.

With spelter commanding £110 in London it will be curious and interesting to figure out some day why the Germans should be able to buy it in 1000-ton lots at the equivalent of £29 in their country.

On June 15 the attorney-general of Missouri filed a charge against a long list of zinc-smelting companies, including about all of the zinc smelters of the United States, alleging that they have entered into an unlawful combination for the purpose of buying ore in the Joplin district to the disadvantage of the producers of ore in that district.

Zinc Sheets are a little lower; base price $30 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Usual extras charged.

DAILY PRICES OF METALS IN NEW YORK

June	Sterling Exchange	Silver, Cts. per Oz.	Copper: Electrolytic, Cts. per Lb	Tin: Spot, Cts. per Lb	Lead: New York, Cts. per Lb.	Lead: St. Louis, Cts. per Lb.	Zinc: St. Louis, Cts. per Lb.
10	4.7838	49½	19.60 @19.80	40¾	6.25 @7.00	6.00 @7.00	23.00 @24.00
11	4.7831	49⅜	19.65 @19.90	41	6.50 @7.50	6.50 @7.50	21.00 @23.00
12	4.7825	49⅜	19.75 @20.00	41	7.00 @8.00	7.00 @7.75	21.00 @23.00
14	4.7800	49½	19.90 @20.10	42½	7.00 @8.00	7.00 @7.75	20.00 @22.00
15	4.7700	49¼	19.90 @20.10	42	6.75 @7.25	6.75 @7.25	19.50 @20.50
16	4.7650	49⅛	19.80 @20.05	41	6.50 @7.00	6.50 @6.90	19.00 @20.50

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only the St. Louis price is herein quoted, St. Louis being the basing market. We quote the New York price at 17c. per 100 lb. above the St. Louis price.

Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are; St. Louis-New York, 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

June	Silver	Copper: Spot £ per Ton	Copper: Spot Cts. per Lb.	Copper: 3 Mos.	Copper: Electrolytic	Tin: Spot	Tin: 3 Mos.	Lead: £ per Ton	Lead: Cts. per Lb.	Zinc: £ per Ton	Zinc: Cts. per Lb.
10	23 1/16	83½	18.14	84½	95	166	164½	27⅝	6.00	107½	23.36
11	23⅜	84½	18.35	85½	95	168	166	27⅞	6.06	110	23.90
12	23⅜	.....	.....	.....	....	.....	....	.....	.....	....	....
14	23 7/16	86½	18.74	87½	96½	174½	170	28½	6.11	110	23.90
15	23⅜	86½	18.74	87½	96	173½	169½	27⅞	6.06	110	23.90
16	23⅜	85½	18.57	86½	96½	169	167	25½	5.45	110	23.90

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for electrolytic, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½c.

Other Metals

NEW YORK—June 16

Aluminum is strong and has some tendency to advance. There are only small stocks of imported metal. The chief domestic producer is reluctant to quote. Prices reported are 28@30c. per lb. for No. 1 ingots, New York.

Antimony—The market is experiencing a quiet spell and there is very little business doing. In the absence of sales prices are altogether nominal. For ordinary brands 36@38c. per lb. is asked; while for Cookson's 46@48c. is named, with no sales.

A U. S. Consular report from Hankow, China states that the exports from that district to the United States in 1914 were 10,071 tons crude metal, 1384 tons regulus and 13,958 tons ore, oxide and dross. The exports for three months ended Mar. 31, 1915, were 2560 tons crude metal and 1067 tons regulus.

Nickel is steady and unchanged. Ordinary forms are 40@45c. per lb., according to size and terms of order. Electrolytic, 3c. per lb. higher.

Quicksilver is strong and prices have advanced, partly on account of the demand from cartridge makers and partly because of the embargo on exports from Italy. New York quotation for large lots is $95 per flask of 75 lb.; for smaller orders, $95@100 per flask. San Francisco price is telegraphed at $85@90, with a strong tendency. London price is £14 15s. per flask, with the same quotation from second hands.

Gold, Silver and Platinum

NEW YORK—June 16

Gold Imports at New York included some further amounts from Ottawa. The total gold brought from Ottawa since that place was made a depositary for London is nearly $71,000,000, and more is reported to be coming.

Sterling Exchange during the last week reached about the lowest point on record, 4.76¼ being quoted on one day.

Gold production in the Transvaal in May was $15,782,537; for the five months ended May 31 it was $75,502,715; showing increases over 1914 of $895,504 for May and $5,867,117 for the five months.

Silver—The market is dull. The foreign demand is limited; but this is offset by the fact that exports also have declined so that the supply and demand have marked step together, both being smaller in volume. The decline in foreign exchange has contributed in a measure to mark down the London bar silver quotation as expressed in cents per ounce in New York.

Shipments of silver from London to the East Jan. 1 to June 3, as reported by Messrs. Pixey & Abell, in values:

	1914	1915	Changes
India	£3,427,500	£2,335,500	D. £1,092,000
China	40,000	5,000	D. 35,000
Total	£3,467,500	£2,340,500	D. £1,127,000

The shipments in 1914 are the smallest recorded for a number of years.

Platinum—The market has been slightly more active but is still quiet. No change of any importance is noted. Dealers continue to ask $37@39 per oz. for refined platinum and $41@44 per oz. for hard metal.

METAL EXPORTS AND IMPORTS

Exports and Imports of Secondary Metallic Products in the United States, three months ended Mar. 31, in pounds:

	Exports		Imports	
	1914	1915	1914	1915
Copper sulphate	4,855,277	6,737,029	.....	.....
White lead	4,080,643	5,363,789	.....	.....
Zinc oxide	7,506,591	10,616,321	.....	.....
Zinc dust	19,612	86,660	1,289,249	501,988
Zinc dross	572,477	2,936,500	.....	.....

The exports of zinc dust given above are reëxports of imported material.

British Imports and Exports of Metals, other than iron and steel four months ended Apr. 30, in long tons:

	Imports		Exports	
Metals:	1914	1915	1914	1915
Copper	57,527	62,569	22,312	12,894
Tin	15,359	19,018	14,935	15,144
Lead	77,265	80,935	20,066	19,041
Zinc	45,269	40,198	3,692	1,038
Quicksilver	773	658	282	67
Minor metals	3,099	1,799	8,959	5,892
Ores, etc.				
Tin concentrates	14,050	16,487	.....	.....
Pyrites	315,186	283,039	.....	.....

Copper includes metallic contents of ore and matte. Exports include reëxports of foreign materials.

Zinc and Lead Ore Markets

JOPLIN, MO.—June 12

Blende, high price, $137.50; assay base price per ton of 60% zinc, premium ore, $120@135; Medium grades, $105@116; ore sale of low-grade was made at $78; average, all grades of zinc, $107.04 per ton. Lead, high price $73, base $72 per ton of 80% metal content; average, all grades of lead, $71.56 per ton.

SHIPMENTS WEEK ENDED JUNE 12

	Blende	Calamine	Lead	Values
Totals this week..	14,026,770	1,091,180	1,539,620	$864,200
Totals this year..	265,624,660	23,726,640	39,139,550	$10,361,750

Blende value, the week, $773,710; 24 weeks, $8,899,860.

Calamine value, the week, $35,420; 24 weeks, $476,470.

Lead value, the week, $55,070; 24 weeks, $985,420.

Sellers declined, for the bulk of ore, to consider any bid until 2 o'clock this afternoon, and some had previously declined $125. The price of $135 was made just after 2 o'clock, and is for next week's delivery of ore. On this account less than one-third of this week's output was sold.

PLATTEVILLE, WIS.—June 12

The base price paid for 60% zinc this week was $125 per ton. The base price paid for 80% lead ore was $63 per ton.

SHIPMENTS WEEK ENDED JUNE 12

	Zinc Ore Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	4,285,820	64,900	843,100
Year	84,012,970	3,040,090	**11,949,470**

Shipped during week to separating plants, 3,612,970 lb. zinc ore.

Iron Trade Review

NEW YORK—June 16

The iron and steel markets are still showing their favorable side and business is on the increase rather steadily. Foreign orders continue to be a prominent feature.

The growing production of pig iron and its absorption by buyers seem to show that the increase in business is on a solid basis. The recent gains in output have come from the steel-works furnaces rather than from the merchant stacks, but the latter seem to be doing at least fairly well, and the number in blast is increasing.

United States Steel Corporation reports a total of 4,264,598 tons of unfilled orders on the books May 31. This is an increase of 102,354 tons over Apr. 30. As compared with the high point reached this year on Feb. 28 it is a decrease of 80,773 tons.

Pig Iron Production in May again showed an increase. On June 1 there were 207 coke and anthracite stacks in blast having a total daily capacity of 72,600 tons; an increase of 1200 tons over May 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in May was 2,279,500 long tons; for the five months ended May 31 it was 9,839,900 tons. Of this total 7,190,000 tons or 7.31%, was made by the furnaces owned or operated by steel companies.

PITTSBURGH—June 15

Conditions in the steel trade continue to improve. Production is slightly heavier, bordering upon 80% of capacity, while the larger export and war business now being booked, as well as railroad business recently placed, but not yet entered on mill rolling schedules, promise a further increase in actual steel production before the close of the month. The opinion is gaining ground that by August the steel industry will be operating practically at capacity.

The Steel Corporation's report of unfilled obligations at the close of May proved more favorable than expected in the trade, the gain in May being 102,354 tons, while opinion had been about equally divided as to whether any increase at all would be shown. Contracting was not regarded as very active during May, while this month there is fairly heavy contracting, and a large increase in the corporation's unfilled obligations is expected for June.

Steel prices are showing a slight advancing trend. The Carnegie Steel Co. has withdrawn its 1.20c. price on bars, plates and shapes for prompt shipment, and other large mills are expected to take similar action in the next week or two. This would place the general market on the basis of 1.25c., the price that has lately been quoted on third-quarter contracts.

Under date of June 15 the National Tube Co. has published new steel boiler-tube discounts, effecting an advance of $2 a ton, following a similar advance on May 1. The discount on 3½- to 4½-in. is now 73% off list, large lots being understood to command four points greater discount.

FERROALLOYS

Recent English quotations are as follows: Ferrotungsten, 75 to 85% tungsten and not over 1% carbon, $1.08 per lb. Ferromolydenum, 70 to 80%, $4.32 per lb. Ferrochrome, 4 to 6% carbon, $131 per ton; 6 to 8% carbon, $126.50; 8 to 10% carbon, $121.50. Ferrosilicon, 45%, $68.50; 25%, $49 per ton.

FOREIGN IRON

British Foreign Trade in Iron and Steel four months ended Apr. 30, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£10,925,322	£2,160,430 Exp.	£8,764,892
Machinery, hardware, etc.	9,546,726	4,380,485 Exp.	5,166,241
Totals	£20,472,048	£6,540,915 Exp.	£13,931,133
Totals, 1914	36,809,619	10,843,114 Exp.	15,966,505

Actual tonnage of iron and steel exported was 1,591,769 tons in 1914, and 916,405 in 1915; imported, 800,547 tons in 1914, and 260,179 tons this year.

The German Iron & Steel Union reports the total production of pig iron in April at 938,679 metric tons, almost exactly the same as in March, the difference being only 241 tons. It was, however, 595,750 tons less than in April, 1914. For the four months ended Apr. 30 the total make was 6,149,690 tons in 1914, and 3,554,873 tons in 1915; a decrease of 2,594,817 tons, or 42.2%, this year.

IRON ORE

Shipments of iron ore from the Lake Superior region in May were 5,012,359 tons. For the season to June 1 the shipments are reported by the "Iron Trade Review" as below, in long tons:

Port	1914	1915	Changes
Escanaba	495,917	528,566	I. 32,649
Marquette	121,873	183,365	I. 61,492
Ashland	341,766	557,664	I. 215,898
Superior	1,735,607	851,064	D. 884,543
Duluth	734,090	2,149,310	I. 1,415,220
Two Harbors	692,496	1,246,222	I. 553,726
Total	4,121,749	5,516,191	I. 1,394,442

Out of the shipments of 5,516,191 tons of Lake ore up to June 1, a total of 3,765,794 tons, or 68.3%, went to Lake Erie ports.

Owing to the reduction of railroad freights from the mines to docks on June 1, the standard prices of Mesabi ores have been reduced by 5c. The schedule of ore prices is now: Old Range bessemer, $3.75; Mesabi bessemer, $3.45; Old Range nonbessemer, $3; Mesabi nonbessemer, $2.80 per ton, f.o.b. Lake Erie docks.

Arrivals at Baltimore for the past week included three cargoes, 16,200 tons, of manganese ore from Brazil.

OTHER ORES

Tungsten Ore prices as announced by buyers in Colorado, the schedule varying from $1 per unit for very low grade ore up to $8 per unit for 60% concentrates. The rise in price according to grade is variable; from 1 to 9% it increases $3.25 per unit; 10 to 19%, only 45c. per unit; 20 to 29%, the advance is 90c.; from 30 to 39% it is 45c. again; 40 to 49%, it is 45c.; while from 49 to 60%, it is $1 per unit. Prices are for ore delivered at Primos Mill, Lakewood, Colorado.

The price of tungsten ores has advanced sharply owing to various causes, the chief one being short supply, owing to interruption in mining in several countries by the war. The price for concentrates carrying 60% WO_3 is now at least $10 per unit.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 314,897 short tons; shipments, 321,144 tons. Shipments of Greensburg and Upper Connellsville coke were 33,789 tons.

Anthracite Shipments in May were 5,797,961 long tons, being 688,240 tons less than in April and 483,582 tons less than in May, 1914. For the five months ended May 31 the total shipments were 26,815,603 tons in 1914 and 26,279,202 in 1915, a decrease of 536,401 tons, or 2%, this year.

British Fuel Exports four months ended Apr. 30, in long tons:

	1914	1915	Changes
Coal	22,644,387	14,989,490	D. 7,654,897
Coke	369,364	305,697	D. 63,667
Briquettes	666,276	388,907	D. 277,369
Steamer coal	6,559,730	5,154,395	D. 1,405,335
Total	30,239,757	20,838,489	D. 9,401,268

Imports are insignificant, being only 11,128 tons in 1914 and 803 tons this year.

Coal Exports from the United States in April showed a sharp increase over previous months this year; for the three months ended Mar. 31 there was a considerable decrease from 1914. For April and the four months ended Apr. 30 the total was as follows, in long tons, not including bunker coal:

	April		Four Months	
	1914	1915	1914	1915
Anthracite	396,260	453,527	963,919	949,241
Bituminous	772,037	1,112,668	3,480,718	3,023,555
Total	1,168,297	1,566,195	4,444,637	3,972,796

The increase in foreign shipments of bituminous coal in April was chiefly to Italy, Argentina and Brazil. The foreign anthracite trade was chiefly with Canada.

SAULT STE. MARIE CANALS

The total freight passing through the Sault Ste. Marie canals in May was 7,348,566 short tons. For the season up to June 1 the total freight was: West bound, 2,017,687; east bound, 6,765,615; total, 8,783,302 short tons, or 520,666 tons more than last year. The total number of vessel passages was 2995 showing an average cargo of 2933 tons. The mineral freights included in the totals were:

	1914	1915	Changes
Anthracite	287,938	378,221	I. 90,283
Bituminous coal	2,192,001	1,397,902	D. 794,099
Iron ore	3,765,007	5,318,633	I. 1,553,626
Pig and m'f'd iron	100,808	46,901	D. 53,907
Copper	9,169	26,118	I. 16,949
Salt, bbl.	266,133	147,301	D. 118,832

Iron ore was 60.6% and coal 20.2% of the total freight reported this year.

Chemicals

NEW YORK—June 16

The general markets show little change, except that they are slightly steadier, so far as heavy chemicals are concerned. Prices for many minor products are unsettled.

Arsenic—The market continues quiet with only a moderate business forward and supplies sufficient. Prices are about $4 per 100 lb., for both spot and futures.

Copper Sulphate—On a fair business the market is steady and prices unchanged. Quotations are $7 per 100 lb. for carload lots and $7.25 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is not specially active, but there are considerable sales from time to time. Quotations are a shade lower at 2.20c. per lb. for spot and for all positions this year.

Imports and Exports of Raw Material for chemical manufacture in the United States, three months ended Mar. 31, in long tons:

	Imports		Exports	
	1914	1915	1914	1915
Sulphur	3,452	4,858	18,952	1,937
Pyrites	217,034	117,609	.....	.....
Chrome ore	34,600	11,300	.....	.....
Magnesite	152,053	89,602	660	367

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total sulphur imported this year was 51,900 tons.

Imports and Exports of Fertilizing Chemicals in the United States, three months ended Mar. 31, in long tons:

	Imports		Exports	
	1914	1915	1914	1915
Kainit	201,660	3,786	.....	.....
Manure salts	46,683	4,159	.....	.....
Other potash salts	78,819	62,098	688	945
Nitrate of soda	106,842	69,709	1,539	6,221
Sulphate of ammonia	26,502	18,207	.....	579
Phosphates	.....	.....	333,094	14,352

Exports include reëxports of foreign material. Some phosphates are imported, but are not given separately in the returns.

PETROLEUM

Exports of mineral oils from the United States in April were 170,944,645 gal., being 49,088,583 gal. less than in April, 1914. For the four months ended Apr. 30 the total exports were 708,120,790 gal. in 1914, and 641,201,669 gal. in 1915; a decrease of 66,919,121 gal., or 9.4%, this year.

The monthly report of the "Oil City Derrick" shows new wells completed in May as follows: Pennsylvania grade, 337; Lima-Indiana, 33; Central Ohio, 51; Kentucky, 19; Illinois, 52; Mid-Continent, 299; Texas-Louisiana, 147. In May 938 wells were completed in the field covered by the report, a decrease of 40 from the April figures. New production amounted to 174,201 bbl., or 12,059 bbl. less than shown by the previous report. At the end of May there were 457 rigs up and 1449 wells drilling.

Assessments

Company	Delinqe	Sale	Amt.
Advance, Ida., (post.)		July 1	$0.005
Belcher, Nev., (post.)	June 14	July 8	0.15
Best & Belcher, Nev., (post.)	June 14	July 8	0.05
Blue Bell, Ida	July 5	Aug. 4	0.003
Blue Star, Ida	June 19	July 10	0.01
Carbonate, Ida	July 23		0.001
Cash Boy, Nev	May 17	June 17	0.01
*Contact Copper, Mich		July 14	0.50
Contact Copper, Mich	May 15		0.50
Crown Point, Nev., (post.)	June 16	July 8	0.15
Duluth, Ida	June 5	July 8	0.001
Glen Metal, Ida	May 31	July 1	0.002
Hancock Cons., Mich	Sept. 1		1.00
Hancock Cons., Mich	Jan. 3		1.00
Idora, Ida	June 3	July 2	0.005
Iron Mask, Ida	July 1	Aug. 10	0.002
Laclede, Ida	May 24	June 14	0.003
Majestic-Idol, Nev	Dec. 15	July 20	0.005
Mayflower, Ida	June 15	July 17	0.005
Mineral Range, Utah	May 24		0.003
Monarch Pitts., Nev	June 14	July 14	0.01
Moonlight, Ida	June 5	July 8	0.005
Mullan, Ida., (post.)		June 24	0.002
New Arcadian, Mich	June 1		0.50
New Arcadian, Mich	Dec. 1		0.50
North Bunker Hill, Ida	June 12	July 17	0.002
North Lake, Mich		June 15	1.00
Ophir, Nev	June 4	June 25	0.05
Rainbow, Ida	July 7	Aug. 7	0.002
Raymond-Illinois, Utah	May 24	June 9	0.005
Raven, Ida	May 15	June 14	0.0006
Rhode Island, Ida	June 24	July 24	0.001
Royal, Ida	June 1	July 6	0.0015
Selma, Utah	May 29	June 16	0.005
Silver Moon, Ida	May 18	June 18	0.005
Silver Mountain, Ida., (post.)		July 15	0.002
Silver Pick, Nev	June 5	July 12	0.01
Sunset Dev., Ida	June 30	July 24	0.0025
Treasure, Calif			0.05
Union, Nev	June 18	July 9	0.05
United Tintic, Utah	May 25	June 15	0.005
Virginia, Ida., (post.)		June 29	0.02
West Tonopah Con., Nev	July 10	Aug. 10	0.01
Wisconsin, Ida	May 15	June 15	0.003
Yellow Jacket, Nev., (post.)	June 14	July 8	0.15

*This assessment was levied and payable Apr. 27, '14.

Stock Quotations

The lead stocks continued their skyrocket career upward. Other mining issues advanced somewhat during the week, but were by no means so strong.

COLO. SPRINGS	June 15
Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con	.01
C. K. & N	.03
Doctor Jack Pot	.10⅛
Elkton Con	.39⅛
El Paso	.90
Findlay	.04
Gold Dollar	.02
Gold Sovereign	.04½
Golden Cycle	1.76½
Isabella	.17⅛
Jack Pot	.06½
Jennie Sample	.02
Jerry Johnson	.04½
Lexington	‡.008
Mary McKinney	.35
Pharmacist	‡.01
Portland	1.40
Raven B. H	.02
Vindicator	1.65

SALT LAKE	June 16
Name of Comp.	Bid.
Beck Tunnel	.05½
Black Jack	.08½
Colorado Mining	.10½
Crown Point	.01
Daly-Judge	6.95
Gold Chain	.12½
Grand Central	.62
Iron Blossom	.74
Little Bell	.14
Lower Mammoth	.03
Mason Valley	3.00
May Day	.23
Opohongo	.00⅛
Prince Con	.49½
Seven Troughs	.01
Silver King Coal'n	3.55
Silver King Con	2.20
Sioux Con	.03
Uncle Sam	.05½
Yankee	.03

TORONTO	June 15
Bailey	.02½
Coniagas	.05
Peterson Lake	.27½
Right of Way	.04½
Seneca Superior	1.10
Silver Queen	.01½
T. & Hudson Bay	18.50
Timiskaming	.35½
Wettlaufer-Lor	.03½
Big Dome	15.25
Dome Exten	.09½
Foley O'Brien	.30
Hollinger	25.75
Imperial	.05½
Jupiter	.09⅛
McIntyre	.40
Pearl Lake	.01⅛
Porcu. Crown	.77
Preston E. D	.02
Rea	.11

SAN FRANCISCO	June 16
Comstock Stocks	
Alta	.04
Andes	.05
Belcher	.20
Best & Belcher	.06
Caledonia	.24
Challenge Con	.06
Confidence	.07
Con. Virginia	.06
Gould & Curry	.03
Hale & Norcross	.03
Julia	.02
Mexican	.35
Occidental	.79
Ophir	.11
Overman	.06
Potosi	.03
Savage	.03
Sierra Nevada	.05
Union Con	.18
Yellow Jacket	.30
Misc. Nev. & Cal.	
Belmont	4.50
Jim Butler	.90
Lone Star	.06
MacNamara	.03
Midway	.17
Mont.-Tonopah	.30
North Star	.16
Rescue Eula	.09
West End Con	.87
Atlanta	.31
Booth	.51
C.O.D. Con	.04
Comb. Frac	.09
Jumbo Extension	1.52½
Pitts.-Silver Peak	.08
Round Mountain	.43
Sandstorm Kendall	.07
Silver Pick	.10
Central Eureka	.16
So. Eureka	1.50

N. Y. EXCH.	June 15
Name of Comp.	Clg.
Amalgamated	76½
Am.Sm.&Ref.,com	81⅛
Am. Sm. & Ref., pf.	107⅛
Am. Sm. Sec., pf. B.	‡80
Anaconda	37
Batopilas Min	1⅛
Bethlehem Steel	165
Bethlehem Steel, pf.	118
Chino	46⅛
Colo. Fuel & Iron	30
Federal M. & S., pf.	59
Great Nor., ore., ctf.	36½
Guggen. Exp	65⅛
Homestake	117½
Inspiration Con	32⅛
Mex. Petroleum	77
Miami Copper	27½
Nat'l Lead, com	66
National Lead, pf	110⅛
Nev. Consol	15½
Ontario Min	3⅛
Quicksilver, pf	4½
Ray Con	25⅛
Republic I&S, com	29⅛
Republic I&S, pf	87
SlossSheffl'd, com	35
Tennessee Copper	38⅛
Utah Copper	69
U. S. Steel, com	59⅛
U. S. Steel, pf	108½

N. Y. CURB	June 15
Name of Comp.	Clg.
Alaska Juneau, w.i.	13⅛
Alta Con	.70
Beaver Con	.30
Big Four	.05
Blue Bell	.03
Braden Copper	7½
Buffalo Mines	.60
Can. Cop. Corpn	1 1/16
Can. G. & S	.03
Caribou	.50
Cashboy	.07
Chambers Ferland	.15
Con. Ariz. Sm	13/16
Con. Coppermines	2½
Con. Nev.-Utah	7/16
Davis-Daly	1⅛
Diam'field-Daisy	.04
Dia. Black B	.04
Florence	.52
Goldfield Con	1 1/16
Goldfield Merger	.23½
Greene Cananea	42
Kerr Lake	4⅛
La Rose	.50
McKinley-Dar-Sa	.32
Mines of Am	2⅛
Nevada Hills	.23
New Utah Bingham	3⅛
Nipissing Mines	6
Ohio Copper	9/16
Oro	.25
South Utah	⅛
Stand'd Oil of N.J.	402
Standard S. L	1 9/16
Stewart	2 2/16
Tonopah	7⅛
Tonopah Ex	2⅞
Tonopah Merger	.40
Tribullion	⅜
Tularosa	7/32
West End Ex	‡.04
Yukon Gold	2⅛

LONDON	June 2
Alaska Tre'dwell	£7 7s 6d
Cam & Motor	0 15 0
Camp Bird	0 5 6
El Oro	0 7 3
Esperanza	0 7 6
Mexico Mines	3 12 6
Oroville	0 12 0
Santa Gert'dis	0 7 6
Tomboy	1 4 6
Tough Oakes	0 9 0

BOSTON EXCH	June 15
Name of Comp.	Clg.
Adventure	2¼
Ahmeek	400
Alaska Gold M	37⅛
Algomah	3
Allouez	57
Am. Zinc	52½
Ariz. Com., ctfs.	8½
Bonanza	.50
Butte-Balaklava	3½
Butte & Superior	71½
Calumet & Ariz	66½
Calumet & Hecla	595
Centennial	20
Cliff	1½
Copper Range	57½
Daly West	4⅛
East Butte	13½
Franklin	10⅛
Granby	89½
Hancock	20½
Hedley	28½
Helvetia	.50
Indiana	7
Island Cr'k, com	46
Island Cr'k, pfd	89½
Isle Royale	30
Keweenaw	2½
Lake	14½
La Salle	6¼
Mass	14
Mayflower	5
Michigan	1¼
Mohawk	79
New Arcadian	11¼
North Butte	33½
North Lake	2¼
Ojibway	2½
Old Colony	4
Old Dominion	56½
Osceola	90½
Quincy	88
Santa Fe	2 1/16
Shannon	9
Shattuck-Ariz	28
Superior	30
Superior & Bost	‡3⅛
Tamarack	38
Trinity	5½
Tuolumne	42
U. S. Smelting	48⅛
U. S. Smelt'g, pf	47½
Utah Apex	4⅛
Utah Con	15½
Victoria	3
Winona	4
Wolverine	62½
Wyandot	1

BOSTON CURB	June 15
Name of Comp.	Bid.
Alvarado	.70
Bingham Mines	.10½
Boston Ely	.30
Butte & Lon'n Dev.	.23
Calaveras	1 1/16
Calumet-Corbin	.07
Chief Con	1½
Corbin	.75
Cortez	.50
Crown Reserve	.75
Eagle & Blue Bell	2⅛
First Nat. Cop	2½
Houghton Copper	4
Iron Cap Cop., pf	6½
Majestic	.70
Mexican Metals	.19
Nevada-Douglas	.50
New Baltic	3½
Oneco	1⅛
Raven Copper	.10
Smokey Dev	.20
So. Lake	6⅛
Tonopah Victor	.32
Trethewey	.13
United Verde Ext	4 1/16

‡Last Quotations.

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.493	58.519	50.250	27.416	26.958	23.709
May	60.361	58.175	49.915	27.825	26.704	23.570
June	58.990	56.471		27.199	25.948	
July	58.721	54.678		27.074	25.219	
August	59.293	54.344		27.335	25.979	
September	60.640	53.290		27.986	24.260	
October	60.793	50.654		28.083	23.199	
November	58.995	49.082		27.263	22.703	
December	57.760	49.375		26.720	22.900	
Year	59.791	54.811		27.576	25.314	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.49	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64.276	66.152	69.170	*
April	14.211	16.811	64.747	75.069	69.313	*
May	13.99	18.506	63.182	77.600	67.786	*
June	13.603		61.336		66.274	
July	13.223		60.540		64.955	
August	*		‡		‡	
September	*		‡		‡	
October	*		‡		‡	
November	11.739		53.227		*	
December	12.801		56.841		*	
Year						

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	47.884	163.963	166.225
May	33.360	38.790	150.702	162.675
June	30.577		138.321	
July	31.707		142.517	
August	*		‡	
September	32.675		‡	
October	30.284		‡	
November	33.304		139.391	
December	33.601		147.102	
Av. year	34.301			

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3.937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	4.221	.688	4.142	18.225	21.094
May	3.900	4.274	3.808	4.182	18.503	20.347
June	3.900		3.810		19.411	
July	3.891		3.738		19.051	
August	3.875		3.715		‡	
September	3.828		3.658		‡	
October	3.528		3.384		‡	
November	3.683		3.585		18.500	
December	3.800		3.662		19.097	
Year	3.862		3.737			

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	10.012	4.963	9.837	21.569	49.888
May	5.074	14.781	4.924	14.610	21.393	68.100
June	5.000		4.850		21.345	
July	4.920		4.770		21.568	
August	5.568		5.418		‡	
September	5.380		5.230		‡	
October	4.909		4.750		‡	
November	5.112		4.962		25.016	
December	5.592		5.430		27.369	
Year	5.213		5.061			

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15.07	14.55	13.94	13.45	14.10	13.95
April	14.90	14.55	13.90	13.45	14.13	13.95
May	14.90	14.61	13.90	13.60	14.27	13.83
June	14.90		13.90		13.96	
July	14.90		13.90		13.90	
August	14.90		13.90		14.08	
September	14.90		13.90		14.03	
October	14.84		13.75		13.97	
November	14.59		13.43		13.83	
December	14.70		13.45		13.83	
Year	$14.88		$13.78		$14.01	